THE

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WATER SUPPLY, & SANITARY IMPROVEMENT.

[Registered as a Newspaper.]

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GAS PURIFICATION
BY
OXIDE OF IRON.

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CENTRAL DEPÔTS:
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J. C. and Co. have been for many years the most extensive Manufacturers of Fire-Clay Retorts and Fire-Bricks in the Kingdom. Orders for Fire-Clay Retorts of all shapes and dimensions, and to fit any shaped Mouthpiece, Fire-Bricks, and every other article in Fire-Clay, are promptly executed at their Works as above.
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Established 1830.

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CAST & WROUGHT IRON TANKS FOR DITTO,
And Gas Apparatus of every Description.
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Roofs, Girders, and Bridges, and General Smith's Work.
London Offices: 97, CANNON STREET—
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THE
"OTTO" GAS-ENGINE.
See Page 654.

CROSSLEY BROTHERS,
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THE
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LESMAHAGOW
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AGENT:
JAMES M'KELVIE,
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ESTABLISHED 1840.

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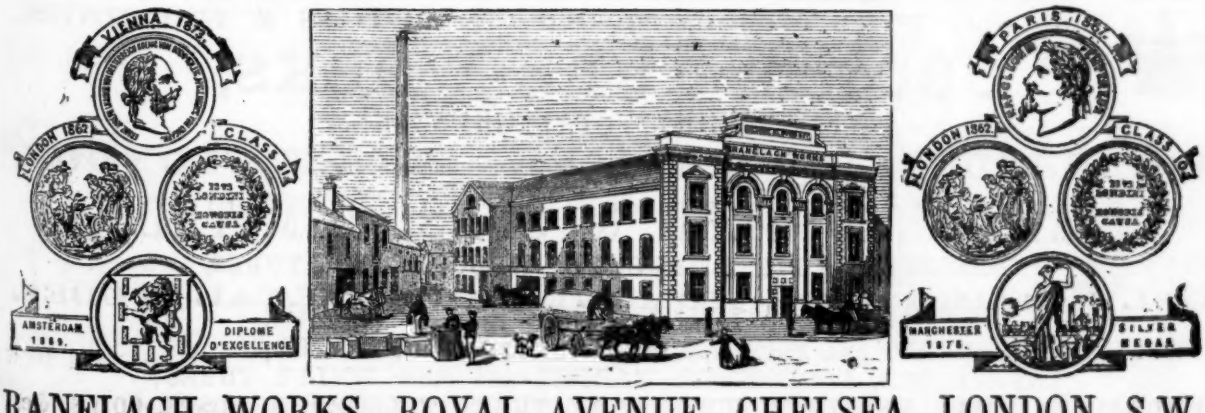
GEORGE GLOVER AND CO.,
DRY GAS-METER MANUFACTURERS,
HAVE REMOVED TO MORE EXTENSIVE PREMISES:



RANELAGH WORKS, ROYAL AVENUE, CHELSEA, LONDON, S.W.

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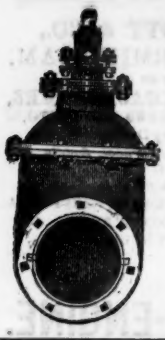
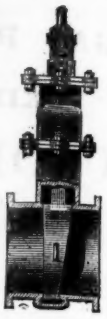
GAS, STEAM, AND HYDRAULIC TUBES AND FITTINGS.



C. & W. WALKERS' DOUBLE-FACED GAS-VALVES.



These solidly constructed double-faced Gas-Valves have taken the place of the old system of the light, single-faced disc, which is too uncertain and unreliable in large bores.

They are guaranteed absolutely gas-tight. They are very massive and rigid, and by improved modes of manufacture they are produced at very little excess in cost over the old light, weak system, which is liable to spring and bend, and become leaky.

The Valve is a rigid wedge of solid cast iron, having two perfectly scraped surfaced facings fitting between the two on the body, which are also surfaced.

A spring in two short halves, and, therefore, not liable to break, is used only for scraping the front facing clean.

The front facing is vertical; the back facing forms the wedge.

At a slight additional expense both flanges are faced to bolt to main-pipes.

MIDLAND IRON-WORKS,

DONNINGTON, near NEWPORT, SHROPSHIRE; 8, FINSBURY CIRCUS, LONDON.

EDWARD E. CROMBIE & CO.,

INVENTORS AND PATENTEES

OF THE

FRICTIONLESS DRY GAS-METERS,

Beg to intimate to Gas Companies and others that they are now prepared to supply these very superior Meters at the same prices as for the ordinary Gas-Meters.

In the construction of this Meter, for which the best tin plates only are used, every mechanical contrivance has been taken advantage of successfully to reduce the friction to a minimum, which is amply proved by the fact that they are made to work upon only one-fortieth of an inch pressure. By an improvement also in their construction, a steadier light is obtained, and greater capacity than can be got from any other Meter in the market. No gas can pass under the valves on any back pressure, as is the case with many other Dry Meters.

To Gas Companies supplying gas through streets with heavy gradients, these Meters are invaluable, as much gas is saved from the low pressure required to work them.

ALL METERS ARE UPHELD FOR FIVE YEARS.

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SULPHATE AMMONIA.

R. W. WALLACE & CO.,

60, MARK LANE, LONDON, E.C.,

Are Buyers of SULPHATE AMMONIA in Large or Small Quantities, or Sell on Commission for Gas Companies and Makers.

PLANT ERECTED ON THE LATEST AND MOST APPROVED PRINCIPLE.

AGENTS to THE GASLIGHT AND COKE COMPANY, LONDON, for the SALE of SULPHATE AMMONIA. Works: BECKTON.

TRADE MARK.

THE MEDAL FOR 1862.

The only Prize Medal awarded for TUBES & FITTINGS.

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WAREHOUSE: SOUTHWARK STREET, LONDON.

JAMES RUSSELL & SONS, LIMITED,

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ONLY MAKERS OF HOMOGENEOUS METAL TUBES.

MANUFACTURERS OF

TUBES and FITTINGS for GAS, STEAM, and WATER;

LAP-WELDED, LOCOMOTIVE, MARINE, and other BOILER TUBES;

HYDRAULIC TUBES, BEDSTEAD TUBES, WELL TUBES, TELEGRAPH POSTS, COILS, &c.

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THOMAS PIGGOTT & CO.,

(Established 1822,)

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PURIFIERS, CONDENSERS, SCRUBBERS, RETORTS, VALVES;

IMPROVED WROUGHT-IRON RETORT-LIDS, CROSS-BARS, & SCREWS;

AND GAS APPARATUS OF EVERY DESCRIPTION.

SOLE MANUFACTURERS OF LIVESEY'S PATENT GASHOLDER MAN-LID,

By use of which Man-lid, inlet and outlet pipes can be examined and cleansed without loss of gas in crown of holder, or ingress of atmospheric air.

ROOFS, GIRDERS, BRIDGES, AND BOILERS OF ALL KINDS.

Drawings, Specifications, and Estimates supplied on application.

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GAS COAL. GAS COAL. GAS COAL.

WELLS, BIRCH, RYDE, and CO., Limited,

HOYLAND SILKSTONE COLLIERIES,

Near BARNSLEY.

This Company is now in a position to raise 2000 tons per day of **REAL OLD SILKSTONE GAS COAL.**

"The quality of this Coal for Gas purposes, if equalled, is not excelled by any on record, and the Coke competes successfully with best Durham."—See *Mining Journal*, Aug. 11, 1877.

Prices quoted to any Railway Station, or F.O.B. Hull, Grimsby, Goole, Keadby, Liverpool, and Fleetwood.

Full particulars will be sent on application to above address.

HYDRATED PURIFYING MATERIAL.

Samples on application.

MESSRS. SPENCE BROS., LIMITED,

Will be glad to supply the above on the most favourable terms, and to treat, by Purchase or Exchange, for Spent Oxide.

PRICES ON APPLICATION.

ALSO PATENT DRY COPPERAS FOR EXTRACTING AMMONIA.

VICTORIA CHEMICAL WORKS, BRADFORD, NEAR MANCHESTER.

ROBT. DEMPSTER & SONS,

GAS ENGINEERS, IRONFOUNDERS, AND CONTRACTORS,

ROSE MOUNT IRON-WORKS, ELLAND, YORKSHIRE.

MANUFACTURERS OF EVERY DESCRIPTION OF

GAS APPARATUS;

CONTRACTORS FOR THE

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Plans and Specifications Prepared, and Illustrated Catalogues forwarded on application.

DANIEL HOWARD,

(Successor to the late BENJ. WHITEHOUSE),

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WROUGHT AND CAST-IRON TANKS FOR DITTO.

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WROUGHT-IRON ROOFS, BRIDGES, GIRDERS, ETC.

STEAM, HOT WATER, AND RANGE BOILERS, TANKS, CISTERNS, BOATS,

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BY

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GAS PURIFICATION & CHEMICAL Co., LIMITED,

PALMERSTON BUILDINGS, OLD BROAD STREET, LONDON, E.C.

JOHN WM. O'NEILL, Managing Director.

HONOURABLE MENTION. **J. E. WILLIAMS & CO.,** PARIS EXHIBITION, 1878.

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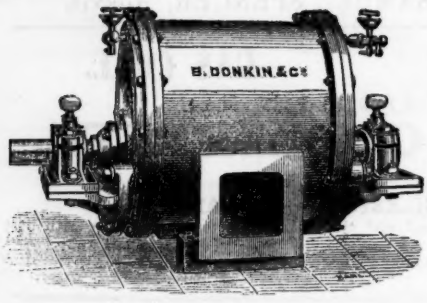
SPECIAL METALLIC OXIDE PAINT,

VICTORIA PAINT WORKS, COLLYHURST, MANCHESTER.



J. BEALE'S

NEW PATENT GAS-EXHAUSTERS,

For the Manufacture of which

MESSRS. B. DONKIN & Co.

POSSESS THE SOLE RIGHT.

Made with two Outside Bearings and with all the Latest Improvements.

FULL PARTICULARS ON APPLICATION.

BERMONDSEY, LONDON, S.E.

Messrs. B. D. & Co. are also Manufacturers of Steam-Engines and of Improved Gas and Water Valves, &c., &c.

CANNEL COAL,

Yielding 11,250 cubic feet of 22·50 sperm candle gas per ton; 1520 lbs. of coke per ton.

Present Price, 16s. per Ton at Pit's Mouth.

ALSO

CANNEL NUTS (same Mine),

Yielding 9875 cubic feet of 18·25 sperm candle gas per ton; 1500 lbs. of coke per ton.

Present Price, 9s. per Ton at Pit's Mouth.

Any Quantity supplied at once, or by Time Contract.

THE DUKINFIELD COLLIERY COMPANY, DUKINFIELD, CHESHIRE.

GOLDSMITH'S PATENT SIGHT WATER-LINE INDICATING GAS-METER.

MANUFACTURED BY GUEST AND CHRIMES,

FOUNDRY AND GENERAL BRASS WORKS, ROTHERHAM;

AND 85, SOUTHWARK ST., LONDON, S.E.

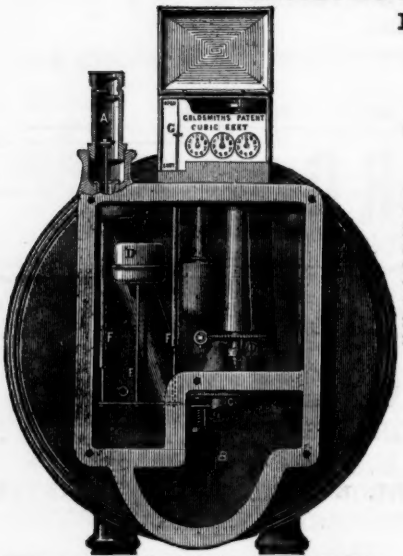


FIG. 1.—Three-light Meter, One-sixth Size.

Fig. 1 is a Meter with front removed to show the arrangement and connection of the Indicator and Valve.

Fig. 2 is front view of Index, with cover up.

The principal object of this invention is to render the water-line in the reservoir at all times visible. It will be seen, by reference to the illustrations, that this is accomplished in the following manner:—On the dial are the words "Open" and "Shut," and attached to the float is the pointer G, which rises and falls with the water-line in the reservoir. If the pointer is at "Open," it shows that the valve is open, and that the reservoir is full. If it is at "Shut," it shows that the reservoir is empty, and that the gas will be shut off.

The following ADVANTAGES will be obvious:—

1. The Inspector can see at a glance if the Meter requires water.
2. No more water than is required need be added, and therefore no water has to run out.
3. The Meter Inspector will be spared a great deal of his most objectionable work, and he will save a great deal of time and trouble.
4. The consumer will not always have to be asked for water, nor will he have to endure the unpleasant smell caused by waste water being run out.

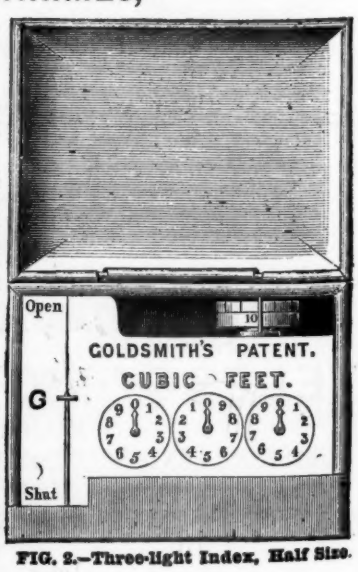
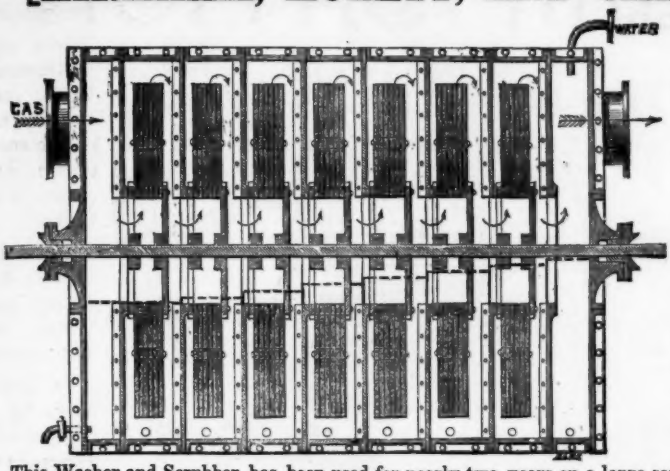


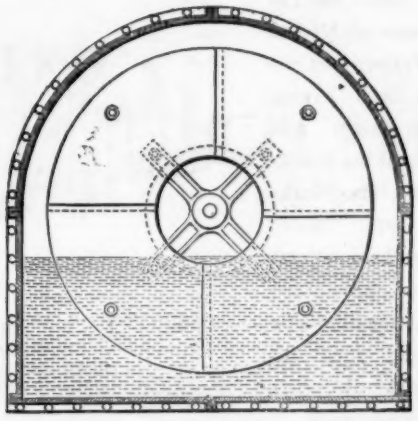
FIG. 2.—Three-light Index, Half Size.

THE

"STANDARD" WASHER & SCRUBBER.

[KIRKHAM, HULETT, AND CHANDLER'S PATENT.]





This Washer and Scrubber has been used for nearly two years on a large scale at the Works of The Gaslight and Coke Company, Bromley-by-Bow, at which station there are now several in operation and in course of construction. There is also one in use at the Pancras Station, King's Cross, of the same Company, which is purifying 1,500,000 cubic feet of gas per day. At the Gas-Works of the Corporation of Leeds, a large one has been erected, which is giving complete satisfaction. The Special Merits of this Washer are as follows:—

That it is a very effective Condenser, so that it is not absolutely necessary to reduce the temperature of the gas to 60°, or thereabouts, to make the Washer effective. That the distribution of the liquor is made with unerring regularity. That it occupies very small space, so that it can be, at little expense, effectually protected from extreme changes of the weather. That the considerable expense of Coke or Wood, or other Scrubbing Material, is entirely saved, and that the great nuisance and cost of from time to time replacing the Scrubbing Material is avoided. That, by the revolution of the discs, the quantity of water carried up by them, and tending continuously to fall, exposes a very large amount of fresh wetted surface to contact with the gas. That it is particularly adapted for Gas-Works where Sulphate of Ammonia is manufactured. That it is much cheaper than any other Scrubber that will do the same amount of work effectually. That it is the only Washer suitable for purifying Gas from all its impurities by solution. That it works with a minimum of pressure. That it takes out every trace of Ammonia from the Gas in once traversing the machine. That it requires very little outlay for foundations.

The following Testimonials show the opinion of eminent Engineers as to the capabilities of the Washer:—

D. HULETT, Esq. *The Gaslight and Coke Company, Bromley-by-Bow, May 3, 1877.*

Dear Sir,—In answer to your inquiries respecting the results of the working of your Patent Washer, I beg to state that I find it a very efficient machine. I have had it in operation for some time, and passed gas through it continuously at the rate of 100,000 cubic feet per hour, and obtained from it 11 gallons of 10 oz. liquor per ton of coal carbonized—results which appear to me very satisfactory for so small a Washer. It works very smoothly, taking but little power, and giving no pressure. I have it still in operation, and am perfectly satisfied with its working.

I am, dear Sir, yours truly, (Signed) W. B. WRIGHT.

Messrs. KIRKHAM, HULETT, and CHANDLER. *The Leeds Corporation Gas-Works, York Street, Leeds, Dec. 6, 1878.*

Gentlemen,—The Scrubber-Washer erected by you at these works, and which has been in use for six months, has proved to be, so far as we have been able to test it, thoroughly efficient. We are at present making 32,000 feet of gas per hour, and are entirely dependent on this apparatus for the removal of Ammonia, and the **Gas is perfectly free from that impurity in the sixth chamber**, so that four chambers remain to deal with an increasing make of gas. Owing to insufficient condensers, the gas was in the summer admitted to the Scrubber at a temperature of 70°, but was reduced therein to 61°, or that of the atmosphere. The volutes are driven at the rate of four revolutions per minute, and, working at that speed, there is not the slightest difference between the inlet and the outlet pressure. Clean water supplied at the rate of 10 gallons per ton of coal carbonized is converted into liquor of from 10 oz. to 13 oz. strength **in once traversing the vessel.** The apparatus is extremely simple and compact, occupies but little space, and requires no foundation. I shall be surprised if it does not eventually become extremely popular.

I am, Gentlemen, yours faithfully, (Signed) HENRY WOODALL, Engineer.

Messrs. KIRKHAM, HULETT, and CHANDLER. *The Gaslight and Coke Company, York Road, King's Cross, Jan. 14, 1879.*

Gentlemen,—In reply to your inquiry, I am pleased to say, the Washer which was put in action at this station in October last has quite fulfilled my expectations, as it confirms the experiments I made in May last with the smaller machine. Working at four revolutions per minute, **it takes out every particle of Ammonia**, while purifying more Gas than it was intended to do. I enclose particulars of a fortnight's working during our heaviest make, by which you will see that it yields the full quantity and strength of liquor, and works with little pressure. I am therefore quite satisfied with the machine, and trust it may meet with the success it deserves.—I remain, &c. (Signed) JOHN CLARK.

The following Table shows the results of the working of one of these Washers, lately erected to purify 60,000 feet of Gas per Hour, at the St. Pancras Station of The Gaslight and Coke Company:—

1879.	Nos. of the Divisions and Strength of Liquor in each.										Water used per Ton of Coals.	Gas Purified per Hour, Cubic Feet.	Ammonia on Outlet.	Temperature.			Pressures.		Revolutions per Minute.
	1	2	3	4	5	6	7	8	9	10				Inlet.	Outlet.	Atmospheres.	Inlet, Inches.	Outlet, Inches.	
	oz.	oz.	oz.	oz.	oz.	oz.	oz.	oz.	oz.	oz.									
January 1	8½	6¾	5	3½	2½	1½	¾	¼	0	0	10 Gallons.	52,000	Nil.	77°	73°	48°	24	23	7½
„ 2	8¾	7	6	4½	3¼	2¼	1½	¾	¼	0	10 „	57,000	Nil.	73°	66°	32°	21¾	20½	4
„ 3	9¼	8	6	3¾	3	2¼	1½	¾	¼	0	10 „	60,000	Nil.	75°	68°	40°	23½	22	4
„ 4	9½	7¾	6½	4¼	3½	2½	1¾	¾	¼	0	10 „	65,000	Nil.	74°	68°	33°	24	22½	5
„ 5	9¾	7	6	4	3	2½	1¼	1	¼	0	10 „	34,000	Nil.	77°	68°	35°	14½	14	5
„ 6	9¼	7¼	6½	4½	3	2¼	1½	1	¼	0	10 „	63,000	Nil.	72°	66°	27°	24	22½	4½
„ 7	11	9	7	5½	3¾	3	1½	1½	¼	0	10 „	59,000	Nil.	74°	66°	31°	25	23½	5
„ 8	9½	7½	6	4½	3	2	1	¾	¼	0	10 „	78,000	Nil.	73°	61°	31°	28	26½	4½
„ 9	11	9	7	5	3¾	2¼	1¼	1	¼	0	10 „	82,000	Nil.	74°	67°	33°	27½	25½	5
„ 10	10¾	8½	6¾	5	3½	2½	1½	1	¼	0	10 „	66,000	Nil.	76°	64°	28°	28½	27	5
„ 11	12½	10	7¾	5¾	4½	3¼	1¾	1¼	¼	0	10 „	61,000	Nil.	73°	64°	27°	26½	25½	5
„ 12	11	8¾	6¾	—	—	—	1¼	¾	¼	0	10 „	39,000	Nil.	74°	64°	27°	26½	25½	5
„ 13	13	10¾	8¼	6	4¾	3¼	2	1½	¾	0	10 „	78,000	Nil.	73°	65°	42°	28	26	5

Messrs. KIRKHAM, HULETT, and CHANDLER. *Corporation of Birmingham, Gas Department, Saltley Works, May 23, 1879.*

Gentlemen,—I beg to enclose you a copy of the results of the tests which, by the kind permission of the Engineer, Mr. Clark, I made on the 6th of March last, of the working of one of your "Standard" Washers and Scrubbers at the St. Pancras Station of The Gaslight and Coke Company, and I am of opinion that, for an apparatus occupying so small a space, they are exceedingly satisfactory.—Yours truly, HENRY HACK, Engineer.

Working Results obtained from KIRKHAM, HULETT, *and* CHANDLER'S *Patent "Standard" Washer and Scrubber at the St. Pancras Station of The Gaslight and Coke Company, London, March 6, 1879.*

Gas passing per Hour, Cubic Feet.	—	Impurities in Gas per 100 Cubic Feet.			Temperature.		Pressure in Inches.	Revolution of Apparatus per Minute.	—	No. of Divisions and Strength of Liquor.										Water Used during Experiment. Gallons.
		SH_2	CO_2.	Grains. NH_3.	Washer.	Air.				—	—	—	—	—	—	—	—	—	—	
64,000	Inlet	2·00	2·00	158·8	72	57	21	4	Twaddel deg. at 60°	5·3	4·9	2·85	2·35	1·7	1·05	0·6	0·3	0·15	0·1	63
	Outlet	1·50	1·50	0·8	68	57	20		Acid, ounces.	11·0	8·4	6·3	4·5	2·7	1·7	1·3	0·7	0·3	—	

WASHER-SCRUBBERS OF THIS PATENT ARE IN COURSE OF CONSTRUCTION FOR BECKTON, BRADFORD, GREENWICH, WOOLWICH, AND SEVERAL OTHER GAS-WORKS.

For further particulars and testimonials, address

Messrs. KIRKHAM & HERSEY, GAS ENGINEERS, 21, ABINGDON STREET, WESTMINSTER.

AN ENGINE WHICH WORKS WITHOUT A BOILER OR STEAM

The durability of these Engines is now established by experience, one of them having run night and day at the Hinckley Gas-Works for over Twelve months without any expenditure for repair; this being equal to about 2½ years average work.

AVERAGE WEEKLY DELIVERY
(INCLUDING CONTINENTAL)
OVER TWENTY ENGINES.

FALKNER & SON.

Over 1900 already delivered.

Very numerous Testimonials from Users, including Engineers, Men of Science, and others, on application to the makers.

No trouble with Coal, Ashes, Smoke, Insurance, Water, or constant attendance.

No Glands to pack, or Water Gauges and Steam Gauges to watch.

STARTS AT A MOMENT'S NOTICE.

THE "OTTO" SILENT GAS-ENGINE.

(Otto and Crossley's Patents, 1876 and 1877,)

THEY ARE USED FOR ALL KINDS OF PURPOSES, CHIEFLY FOR EXHAUSTERS, SCRUBBERS, & PUMPS.

DELIVERED IN MANCHESTER. SIZES { NOMINAL HORSE POWER ½ 1 2 3½ 6 8 12 16 / MAXIMUM HORSE POWER ¾ 1½ 2½ 4 9 12 18 24 } OFFERED. CASES NOT CHARGED IF RETURNED FREE.

PRICES INCLUDE CAST-IRON STAND, TURNED FLY-WHEEL, AND DRIVING PULLEY; WATER-VESSEL, SEVERAL DUPLICATES, AND GAS-FITTINGS (EXCEPTING METER AND PIPES).

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CROSSLEY BROTHERS,
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THE NEW GAS COOKER.

40 PER CENT. OF GAS SAVED.

No. A510 same as our **No. A152,**
BUT LINED WITH PATENT NON-CONDUCTOR.
Will Roast, Bake, and Fry, and with Three Burners for Boiling.

SIZE.
Outside—30in. high, 20in. wide, 20in. deep.
Inside—19½in. „ 14in. „ 17in. „
Price . . . . . **£4 14s. 6d.**

No. A500.
LINED WITH PATENT NON-CONDUCTOR.
Is fitted with Roasting and Baking Oven and Four Burners for Boiling.

SIZE.
Outside—34in high, 20in. wide, 19in. deep.
Inside—30in. „ 16in. „ 17in. „
Hot Plate—24in. by 23in.
Price . . . . . **£7 10s. 0d.**

No. A505.
Same as with Roasting and Baking Oven, a Broiler or Toaster, a Chop Griller, a Hot Water Boiler, and Three Burners for Boiling.
Hot Plate—26in. by 24in.
Price . . . . . **£9 15s. 0d.**

These Cookers are jacketed, on the sides, top, and door, with a new and very efficient non-conducting material, by the use of which a **saving** of gas to the extent of **40 per cent.** is effected.

Gas Companies who are selling or hiring stoves should see these stoves. Catalogues and particulars on application to

JOHN WRIGHT & CO., ESSEX WORKS, BROAD STREET, BIRMINGHAM.

London Warehouses: { 155a, Upper Thames Street, / 1, Little Bush Lane.

TANGYE BROTHERS AND HOLMAN.

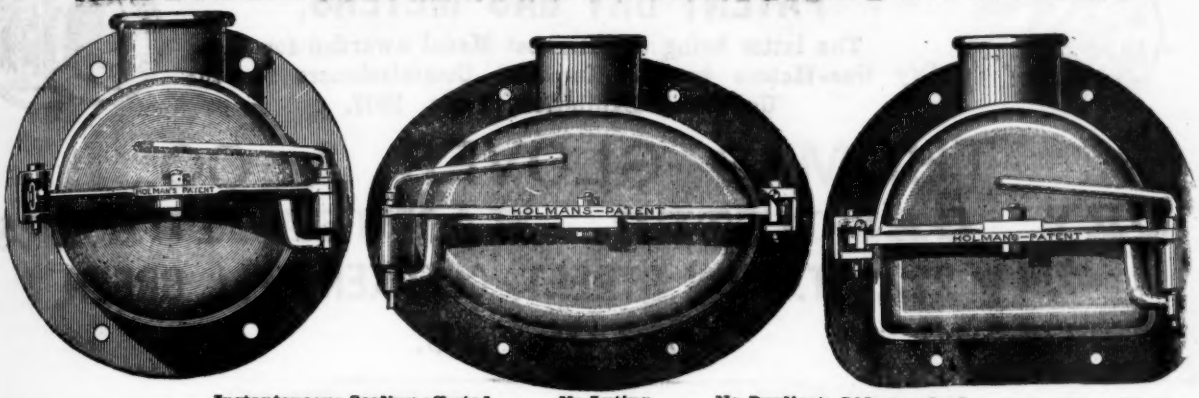
CORNWALL HOUSE, 35, QUEEN VICTORIA STREET, LONDON, E.C.,

(LATE OF 10, LAURENCE POUNTNEY LANE.)

SOLE MAKERS OF MORTON'S PATENT SELF-SEALING RETORT-LIDS,

WITH HOLMAN'S PATENT ECCENTRIC FASTENINGS,

Anti-Friction Catches, and New Self-Adjusting Cross-Bars.



Instantaneous Sealing effected. No Luting. No Duplicate Lids required.

Holman's New Self-Sustaining Cross-Bar ensures freedom of Joint, and maintains parallel position of the Lids.

Since their introduction in 1869, these Patent Retort-Lids have been thoroughly tested, being now in use in nearly all the principal Gas-Works in London and the Provinces.

T. B. and H. are now making the "Morton's Self-Sealing Lid" of the SAME FORM OR SECTION AS THE RETORT (see Illustrations above), as well as bringing the Mouthpiece from the D or Oval at back to Circular in front, as heretofore.

D and Oval Morton's Lids are working satisfactorily both in this country, on the Continent, and in the United States of America. Among others they have been adopted by the following Gas-Works:—

The Gaslight Company's Works, Fulham; Ditto, Bromley-by-Bow; Ditto, King's Cross; Ditto, Shoreditch.
And also in the Gas-Works at Richmond, Maidstone, Gloucester, Glasgow, Portsea, Roubaix (France), The Hague (Holland).

HUNT'S PATENT EQUILIBRIUM GAS-GOVERNOR.

In this Governor a Throttle-Valve is substituted for the ordinary suspended Cone, all external communications being avoided by placing the Lever or Radius Arm (shown in the drawing) inside the Valve-Chamber upon the Disc. The Disc is carried upon steel centres, upon which it is accurately balanced and turns freely. The friction in working is thereby reduced to a minimum. This Governor is extremely sensitive to alterations of inlet or outlet pressure, and renders a large actuating holder unnecessary.

The principal advantages of this arrangement over the ordinary form of Governor are as follows:—

Its sensitive action prevents oscillation.

It is self-adjusting—*i.e.*, it maintains a steady pressure under variations of inlet pressure or a fluctuating consumption.

The inlet to Gasholder being contracted to the smallest possible dimensions, all danger from leakage through insufficiency of seal, tilting, &c., is entirely avoided.

The valve portion being separate from the holder, it can be handled and fixed like an ordinary Slide-Valve direct in the main; and the holder can be placed at an convenient distance immediately above it. The cost is thus materially reduced, and the inconvenience of heavy lifts done away with.

There are no working parts likely to get out of order.

These Governors have been adopted by many leading Gas Companies, among whom are the following:—

The Gaslight and Coke Co. (9), The London Gas Co. (3), and at Abergavenny, Arundel, Birmingham, Cannes (France), Devonport, Dursley, Exeter, Guernsey, Halesowen, Menton (France), Monmouth, Newcastle-on-Tyne, Oxford, Plymouth, Rochdale, Windsor, &c.

TESTIMONIAL.

The Gaslight and Coke Company,
9, Water Street, New Bridge Street,
Blackfriars, E.C., Feb. 27, 1875.

MESSRS. TANGYE BROTHERS AND HOLMAN.

Gentlemen,—The two 24-inch and three 36-inch Hunt's Equilibrium Governors supplied by you, and fixed in the valve rooms at Whitechapel, Goswell Road, and Blackfriars, are working very satisfactorily.

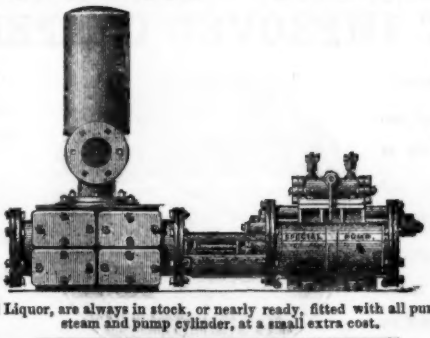
Yours truly,

(Signed) JOHN JOHNSON.

PRICES AND FULL PARTICULARS ON APPLICATION.

THE "SPECIAL" STEAM-PUMP.

Diameter of Steam Cylinder.	Diameter of Water Cylinder.	Length of Stroke.	Gallons of Water per Hour, Approximate.	Reduced Prices.
3	1½	9	450	£16
4	2	9	815	18
5*	2½	12	1,250*	21
5*	3	12	1,830*	22 10
4	4	12	3,250	25
6*	4	12	3,250*	30
5	5	12	5,070	32 10
7*	5	12	5,070*	40
6	6	12	7,330	40
8*	6	12	7,330*	50
7	7	12	9,750	50
10*	7	12	9,750*	65



In use in a Hundred Gas-Works in the United Kingdom for Pumping Ammoniacal Liquor, Water, or Tar.

Messrs. Burt, Boulton, and Haywood, Manufacturing Chemists, have over FORTY "Special" Steam-Pumps in use at their several large Tar-Works.

Two Hundred Sizes made. Those in Table opposite are the leading Sizes for use in Gas-Works and Chemical Works.

* These Sizes being usually selected for pumping Tar and Liquor, are always in stock, or nearly ready, fitted with all pump details in iron, and extra length distance-piece between steam and pump cylinder, at a small extra cost.

TANGYE'S HIGH-PRESSURE AND CONDENSING STEAM-ENGINES; CORNISH, VERTICAL, & TUBULAR BOILERS
HYDRAULIC AND SCREW LIFTING-JACKS, CRABS, PULLEY-BLOCKS, &c.

FULL PARTICULARS, ESTIMATES, CATALOGUES, ETC., ON APPLICATION.

London, 1851. New York, 1853. Paris, 1855. London, 1862.

Dublin, 1865.

The SIX MEDALS AWARDED to THOMAS GLOVER for

PATENT DRY GAS-METERS,

The latter being the Highest Medal awarded for Dry Gas-Meters by the Imperial Commissioners for the Universal Exhibition, Paris, 1867.

Paris, 1867.

THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

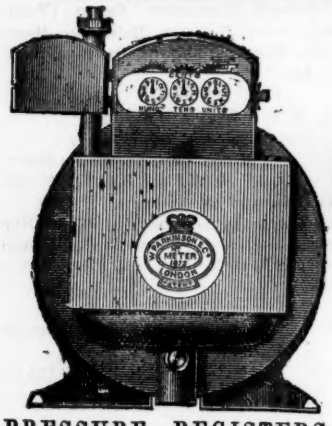
214 TO 222, ST. JOHN STREET, CLERKENWELL GREEN,

LONDON, E.C.

THOMAS GLOVER & CO.'S PATENT DRY GAS-METERS.

1st, Are a remedy for all the defects of Wet Meters;
2nd, Are suitable for all climates, whether hot or cold;
3rd, Incur no loss of Gas by evaporation;
4th, Cannot become fixed by frost, however severe;
5th, Are the most accurate and unvarying measurers of Gas;
6th, Prevent jumping or unexpected extinction of the Lights;
7th, May be fixed either above or below the level of the Lights;
8th, Cannot be tampered with, without visibly damaging the outer case;
9th, Will last much longer than Wet Meters;
10th, Will not cost more than one-half for repair that Wet or Water Meters do;
Are upheld for five years without charge.

WILLIAM PARKINSON AND CO.,



(ESTABLISHED 1816,)

MANUFACTURERS OF

WET & DRY METERS,

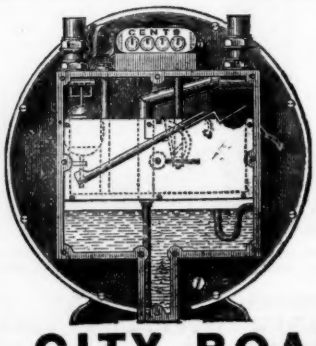
STATION-METERS & GOVERNORS,

EXHAUSTER REGULATORS,

PRESSURE REGISTERS, EXPERIMENTAL APPARATUS, GAUGES, WATER-METERS, &c.

HUNT'S PATENT IMPROVED COMPENSATING METER.

In this Meter, the action of the measuring-drum is reversed. By this arrangement an improvement is effected in the registration at high speeds, which, in many tests, has not varied from the smallest light to three times the capacity of the meter. It works equally well under all pressures. The range of error between the high and low line is much smaller than that allowed by the "Sale of Gas Act."



The Meter has been critically tested, and most favourably reported upon by official Meter Inspectors in London and Birmingham.

W. PARKINSON and CO. have made arrangements for the manufacture of these Meters, both in tin and cast-iron cases, and for the alteration of old ones to this principle, which is confidently recommended as possessing every quality that can be desired by Gas Companies, Corporations, or Private Consumers.

COTTAGE LANE, CITY ROAD, LONDON, E.C.

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THE JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, OCTOBER 28, 1879.

Circular to Gas Companies.

THE report of the last meeting of the Surrey Consumers Gas Company will be seen in another column. In the speech of the Chairman, and the remarks subsequently made by Mr. Finlay, will be found a full statement of the prospects of the Shareholders as regards dividends under the scheme for amalgamation with the South Metropolitan Company, which it is expected will be sanctioned by the Privy Council to-day. The arrangement looks a little complicated, but is in reality very simple. We need not here occupy our space in detailing what will be the effect of reductions in the price of gas on the future dividends of the two Companies, and may once more congratulate the Shareholders and Consumers of the Surrey Company on the happy results which are certain to follow this combination.

The Chartered Company have issued a form of tender for £100,000 worth of their stock, being the second portion of additional capital authorized to be raised, by resolution, under the Company's Act of 1876. This new capital will constitute a portion of their ordinary A consolidated stock entitled to a ten per cent. dividend, subject, of course, to the sliding scale. We have no indication of the reserve price which has been fixed; but it will be remembered that at the recent sale of this Company's stock, the greater part fetched £175, and we have a strong suspicion that something more will be required for the stock that is now offered. The Company's ordinary A stock stands in the market at £180, and the most speculative bidder will probably make up his mind that he will hardly obtain more easy terms. We expect, then, to find that something like this price will rule in the offers made; and the stock will be decidedly cheap at the figure, for the sliding scale brings up the dividend so rapidly, that almost in any case the buyers will be sure of an extremely profitable investment. It may be mentioned that the whole of the capital not sold at the auction above referred to was immediately subscribed for by the Shareholders, who, indeed, offered to take three times the amount. In the present case the biddings are open to all proposers, and therefore we may mention that those who intend to subscribe must send in their applications by noon of the 7th of next month.

An interesting experiment has been made with the electric light at the British Museum. There are in all eleven lamps, seven being placed outside the building and in the corridors, and four in the reading-room, one of these being suspended from the dome, and the other three placed triangularly. These interior lights are produced by a machine transmitting continuous currents, while those outside and in the corridors are worked by a machine giving alternate currents. Each of the lamps in the reading-room reputedly gives a light of five thousand candles, while those in the corridors and outside are said to have an illuminating power of rather less than one-twelfth of that, all *minus* twenty-five per cent., which is cut off by the use of opalescent glass shades. The whole of the arrangements are under the direction of Dr. Siemens, whose machines and apparatus are employed. The carbons in the lamps are nineteen inches in length, and burn at the rate of three inches an hour, so that a light can be maintained for about six consecutive hours, and then a new carbon can be inserted by the most inexperienced hand in the space of little more than half a minute. It is stated that a light of about five thousand candles can be produced for 1s. an hour, whereas the equivalent amount of illumination by gas would cost 5s. 3d., without deducting for the opalescent shades. But, after all, it may turn out that the new light is not so cheap as represented.

It is curious to note that wherever opposition to a Gas Company turns up, the electric light is put forward, like the candle in the scooped turnip, to scare the Company. It was so at Plymouth last week, where the Gas Company, making use of their undoubted powers, have raised the price charged for the public lamps. We cannot say that we at all sympathize with the Town Council in this dispute. They have for several years been treated by the Company in the most liberal way, but when the latter were before Parliament last session every obstacle was raised to the passage of their Bill as promoted. The opposition of the Town Council was to a certain extent successful. They had the initial price cut down, and succeeded in depriving the Company of privileges which they might naturally have looked for. After this determined antagonism, the Council seemed to suppose that they were entitled to every friendly consideration. The Company, however, do not seem to see matters in the same light, and have retaliated in a fashion which was not anticipated. It cannot be that the Company are opposed to the interests of the ratepayers, because, being one of the largest in the borough, they are as much concerned as any one in keeping down the rates. Thus we have to seek for some other explanation, and we find it in the fact that, under the circumstances, the Directors are availing themselves of the full powers they possess. By these they have raised the charge for gas to each public lamp (including lighting, cleansing, and extinguishing) from £2 14s. to £2 17s. 2d.—an advance, it will be seen, of 3s. 2d. per lamp. Against this rise the Town Council protested; but the Company stood out for their rights, and the Council could not do otherwise than yield. We may fairly hope that with this defeat, and with the great advantages they have derived under the Company's Act, gas matters in Plymouth will settle down, and Company and Corporation proceed for the future in a more amicable spirit.

We are gratified to find that the new works of the Bristol Gas Company at Stapleton are already in operation; we mean, of course, the first section of them, because in time these works will be of the most extensive character. The successful completion of this first part reflects great credit on the Contractors, Messrs. John Aird and Sons, who finished the works in less than contract time. We have mentioned before that the designs were made by Mr. Walter Fiddes, the Company's Engineer, and that his son, Mr. Wm. Fiddes, has been the Resident Engineer. The first section of the works now completed comprises a retort-house, 225 feet by 70 feet; an engine and exhauster house, 80 feet by 35 feet; a boiler-house, 40 feet by 35 feet; a station-meter and purifying house combined, 180 feet by 70 feet, with all the appropriate accessories of scrubbers and condensers. The former constitute a figure in the landscape, being likened by the local press to large Martello towers. The ground appears to have been awkward to work in, but every difficulty had been successfully overcome, to the great credit of all concerned. The

orks, in fact, constitute a splendid addition to the plant of he Bristol Gas Company.

Newbury has outgrown its gas-works, and extensions are rgently required. Under these circumstances, the Town ouncil called in the advice of Mr. Bower, of St. Neots, who ery properly backs up the plans of Mr. J. G. O'Farrell, the lanager of the present works, who has devised extensions to nable the Corporation to tide over the next two or three ears, then for the erection of new works to be handed down posterity. Mr. Bower reasonably thinks that posterity ould pay its own quota towards the cost of these exten- ons, and this will, in fact, result from the mode in which is proposed to pay off the principal and interest. The pro- osition is to pay off both in equal annual instalments—a ther unusual proceeding, but one which will carry out Mr. ower's idea. The new works designed by Mr. O'Farrell are ranged to provide for double the present consumption, and ill leave space for further extensions, if, as Mr. Bower puts posterity should have need of them. We sincerely hope that uch will be required, and that Mr. Bower and all of us will ontinue to flourish upon the extension of gas undertakings.

At the eighth quarterly meeting of the Midland Association Gas Managers, which was recently held at Birmingham, ie subject of condensers and condensation was the chief opic discussed. It was introduced by some remarks from Mr. Annan, of Wolverhampton. Perhaps no subject in con- ection with gas manufacture has received more attention han condensation and condensers. Should these latter be ertical or horizontal? should the condensation be rapid or ow—in other words, should the gas be kept a long time ith the tar, or speedily dissociated from it by a reduction temperature? These are questions which have been very eely discussed, but our readers will see that they have been no means settled. As a matter of fact, after all that has en said on both sides, the minds of Gas Managers seem to in as great a haze as ever. One good thing will result om the discussion which we now notice, and that is that the tention of gas managers will be specially directed to the bject, and that with the facts which have been brought fore them by the various speakers they will find materials think upon, and suggestions for experimentation. To this atter we shall return, for it is of too important a nature to disposed of in the few words which we are now able to evote to it.

A joint report by Mr. Peaty and Mr. Winstanley, on Hislop's ocess for revivifying foul lime, was then presented, and ave rise to some conversation. A process for the revivifica- on of foul lime was, we believe, first mooted in this JOURNAL. he idea took hold of the minds of some gas managers, and ie in particular—Mr. Hislop, of Paisley—who has devised a stem of furnaces in which the spent lime is reduced to ustic lime. As to the economy which results from the use this process, we have no doubt. Lime is in some places heap, and in others comparatively dear. In these latter othing could be better than to use Mr. Hislop's system of vivification. In any case waste should be avoided, and though spent lime has a certain value in the manure market, has a higher value to the gas maker, who uses it over and ver again.

THE City and Guilds of London Institute for the Advancement of echnical Education, announce the opening of their technical classes, at owper Street School, Finsbury. In the section of Applied Physics, r. W. E. Ayrton will deliver a course of twelve lectures on "Some of e Practical Applications of Electricity and Magnetism," commencing onday, November 3rd, at 7 p.m. In that of Applied Chemistry, Dr. H. rmstrong, F.R.S., will deliver a similar course on "The First Principles Chemistry," commencing Wednesday, November 5th, at 8 p.m. An augural lecture will be delivered by Mr. Ayrton, on Saturday, November 1, 8 p.m., on "The Improvement Science can Effect in our Trades, and in e Condition of our Workmen." A syllabus of each course of lectures can obtained at the Halls of the Companies of Mercers, Clothworkers, and rapers, or at the Schools, Cowper Street, Finsbury. Intending students ould send in their names to the Demonstrator, Cowper Street Schools, insbury, E.C. The inaugural lecture will be free.

THE Corporation of Manchester, as will be seen from our advertisement lumns, are about to issue £250,000 of Consolidated Stock. This is not actual increase of indebtedness, being mainly intended to replace rminable bonds falling due, and which the Corporation decline to renew. he security is not only upon the city rate, which is unlimited in amount, d assessed upon an annual rental exceeding 2¾ millions, but upon the hole of the landed properties of the Corporation, or which may be quired by them. It is estimated that the present value of their operties alone is between 7 and 8 millions, while the aggregate debt of e Corporation is less than this by at least a million. The stock is thus cured upon real property, without touching the rates, whilst it has, by et of Parliament, the advantage of being personal estate, with absolute curity by registration. It having been represented to the Corporation at it would be a convenience to many parties to be allowed to pay the otments at the end of this year, instead of as mentioned in the advertise- ent, it has been arranged that this can be done and that interest at 4 per nt. will accrue from the date of payment. The stock has been repeatedly d on Manchester Stock Exchange, during the last fortnight, at 106.

Water and Sanitary Notes.

As announced last week, the decision of the owners and ratepayers of Liverpool, at a meeting under the Borough Funds Act, was adverse to the promotion of a Bill in Parliament to enable the Corporation to carry into effect the Vyrnwy scheme. A poll was, of course, demanded, and the papers intended to ascertain more explicitly the views of the ratepayers will be distributed on the 30th inst., and collected on the 3rd of November. In view of the poll, the Water Committee have circulated among the ratepayers a paper which affords them conclusive evidence of the advisability of the scheme which is now promoted. It is made perfectly clear to every candid mind that in the course of a few years Liverpool will be in urgent need of an increased supply of water. It has been shown beyond all doubt that any very great additional supply from the town wells is out of the question, and what can be obtained will be of an objectionable quality. Under such circumstances, more water, of a different quality, must be found, or recourse to the properly-abused intermittent system will once more become necessary. But the questions at issue go deeper than this. The increasing pollution of the wells constitutes a real danger to the health of the inhabitants, and, in the event of an epidemic or a prolonged drought, serious consequences must ensue. The Vyrnwy scheme has been chosen by the Water Committee as the cheapest one presented to them, while at the same time it "offers the greatest "advantages in respect of quantity, quality, and economy, "both present and prospective." The Liverpool Corporation have been unfortunate with their water *plébiscites*. In 1874 the Water Committee prepared a Bill which was intended to give them extraordinary powers of supervision over the domestic supply, and prescribe rigid rules for fittings. This scheme was opposed upon two grounds—first of all, the expense to which it would have put the ratepayers for alterations in their fittings; and then, the horror every Englishman has of domestic intrusion. The consequence was that the Water Committee were beaten by a large majority at a town's meeting, and at the poll which followed, the majority against them was, if we remember rightly, still larger. We hope that nothing like this will happen on the present occasion. The question now at issue is of so much more importance, that we hope the owners and ratepayers will regard it in a more liberal spirit, and wisely give their support to the Water Committee.

It is sad to see that, notwithstanding the Edinburgh Water Trustees have gone to the expense of half a million of money, and nobody knows how much more, in carrying out the Moorfoot water scheme, the greatest dissatisfaction now appears to be felt in Edinburgh as to the nature of the supply. It is abused on all sides; but what is to be done? The money has been spent—wasted or not—and most certainly the ratepayers of Edinburgh cannot afford to enter again upon so expensive an enterprise. What action will have to be taken under the circumstances, the competent Engineer who is to be called in must decide. It will be an arduous task to satisfy all parties; but before a Bill to authorize the expenditure of another quarter of a million is promoted, a decision on the point, carrying weight, must be given to the ratepayers. It is a pity that, when large questions of this kind are entertained, a *consensus* of opinion on the part of those most qualified to judge of a scheme cannot be obtained. We go into a parliamentary committee-room when such questions are discussed, and what do we hear? Echo answers—what? All sorts of contrary statements and opinions. That this will be one of the last occasions, if not the very last, in which the Edinburgh Trustees will find themselves in Parliament, we sincerely hope.

That "water is to be had for nothing" everybody knows who walks about on a rainy day; and it must be remembered that the roof of every house is a species of umbrella, on which the rain is caught, to be diverted into any receptacle which a householder may choose to provide. To say that rain water costs nothing is not exactly the fact, because the cost of the receptacles in which it is stored goes for something. Then the filters which are required, according to Mr. Buck's plan, before the water can be made available for drinking purposes, have to be considered. Thus it may be that, after all, rain water does cost something. We do not at all share Mr. Shirley Hibberd's preference for rain water for domestic use, as set forth in a pamphlet just issued by him, entitled "Water "for Nothing." It has been our lot on two occasions to be called in to remove the most diabolical stench which has ever met our nose, and we found it came both times from rain-water tanks. On these occasions we employed a little of

Condy's fluid, which we would recommend every householder who collects rain water to keep on his premises, and use when the water begins to stink. By this means he can always have a supply of sweet water, which will be agreeable to the taste and admirable for all uses.

The Dublin Sanitary Inquiry is closed, and, we regret to say, with a species of catastrophe. Our readers may possibly know that the Secretary to the Commission was Mr. Dixon, a son of that eminent historian, Mr. Hepworth Dixon. On the day on which the sittings closed, the Secretary went home in apparent good health, but a few hours afterwards was taken with a sudden illness and died. We regard this as a sad misfortune. He was a young man of great promise, and one who, if he had lived, would have done much for literature, if not for science.

The Lower Thames Valley Main Sewerage Board have resolved on applying to the Local Government Board for a Provisional Order to enable them to make compulsory purchase of land in order that they may carry out Lieut.-Col. Haywood's scheme. We sincerely hope that they will not, on this occasion, encounter any serious opposition; but we fear that their foes will once more come to the front, and that a severe struggle will ensue. A Committee of seven members has been appointed to have an interview with the President of the Local Government Board, to ask his advice and assistance under the peculiar circumstances in which the Board are placed.

The Congress of the Sanitary Institute of Great Britain was duly inaugurated last week at Croydon, and the meeting has been of a most satisfactory character. On the opening day, Dr. Richardson, the President for the year, delivered the Inaugural Address. We hardly know whether Dr. Richardson is more of a poet than a physiologist or a physician. Some years ago, to mention only one of his imaginary achievements, he invented the City of Hygeia, in which all the inhabitants were to live to be at least one hundred years old. A city is a very narrow area in which to display sanitary skill, so the learned Doctor has extended his observation, and now evolves from his inner consciousness a "Salutland" or "Salutisland," in which people are to live a hundred and ten to a hundred and twenty years, or even longer. Whether a great age is a blessing or not we must leave those who have arrived at it to decide; but that is nothing to the purpose. Our own experience of people at a very advanced age is that they have to be propped up in arm-chairs, and give a great deal of trouble to their relations, who may be anxiously waiting for what they have to leave behind. We doubt whether "Salutis-"land" would be generally accepted as a blessing; but, blessing or not, it is an impossibility in this country. In the new world, there may be spots, as has been suggested, upon which cities may be built in which some of Dr. Richardson's views might be realized. There is, unless we are mistaken, one at the present moment—Salt Lake City—in which longevity is carried to an extreme, notwithstanding poligamy. But what of all this to the denizens of crowded English cities? We want our slums purified; we want to see the last of typhoid fever, whooping cough, and other horrors; but on these points, unfortunately, our sanitarian friends do not give us any information. Dr. A. Carpenter may expound to us the true principles of Sanitary Science and Preventive Medicine; but when he has done so, how far has he gone in helping us to clear our cities of the horrible zymotic diseases we have named?

Captain Douglas Galton, C.B., F.R.S., does not carry us much farther. He tells us that epidemic diseases are observed to occur where overcrowding is the rule. Everybody knows this, and therefore it was hardly necessary to go to Croydon to obtain the information. He also tells us that with cleanliness, fresh air, and diminished crowding, as is well known, gaol life is eminently favourable to health. That cholera and dysentery are spread by the use of water which is called "impure," is an assertion that is constantly made, but of it there is no actual proof. With regard to sewage, Captain Galton correctly tells us that no plan has yet been devised for the profitable disposal of this refuse, and it must always remain a problem for the Sanitary Engineer. Sewage must, of course, for the sake of health, be got rid of, regardless of profit or cost. There may be a time when some talk on sanitary matters will be indulged in in the class-rooms of our colleges and universities; but to call anything we know of the matter at the present time "Sanitary Science," is an abuse of language.

A paper on "Bad Plumbing" was a very proper subject for the consideration of the Sanitary Institute. Any man who wishes to make our homes healthy, must seriously devote himself to the supervision of the plumbing arrangements. Mr. W. Eassie, C.E., deserves the thanks of all sanitary reformers for calling attention to this matter, which is too often a disgrace to the mechanics engaged.

Dr. Corfield very happily exposed some sanitary fallacies, but at the same time overlooked some sanitary truths. The author is not exactly a firm believer in the zymotic theory of diseases, and he evidently oscillates between two opinions. For our own part, we believe the conditions under which the first case of small-pox was generated may any day be easily repeated, and give rise to other cases. The same applies to other diseases which are termed zymotic. This belief is, we think, gaining ground, and not, as Dr. Corfield put it, "being "scouted." The paper presented much interest, as did several others, to which we have no space to refer. The meeting was most successful, and will encourage the friends and advance the objects of the Sanitary Institute of Great Britain.

THE ORIGIN OF COAL.

Various theories have been propounded to account for the origin of the different kinds of mineral fuel which form the basis of modern industry. The most eminent geologists have hitherto ascribed the formation of coal to large quantities of drift-wood accumulating in estuaries, where they were subsequently covered by sedimentary deposits, the ligneous structure becoming modified in the course of ages. Mons. E. Fremy has recently published some valuable researches on the origin of coal, in the course of which he arrived at results differing considerably from those obtained by other observers. In examining the various substances which might be supposed to give rise to beds of coal, some interesting observations were made. It was found, for instance, that all wood contains a substance which has been called vasculose, and to which its physical properties are chiefly due. It is present in oakwood to the extent of 30 per cent. In searching for a method to distinguish lignites from genuine coal or anthracite, it was found that the former are completely decomposed by nitric acid, which is not the case with the latter. In the first series of experiments, vegetable tissues, or the skeletons of plants, were heated in closed iron tubes for many hours, at a temperature of from 200° to 300° centigrade. Steam, acids, gas, and tar were given off, while the vegetable substances, although becoming black and brittle, retained their original shape, and offered no resemblance to coal.

Other substances produced by the vegetable world were then treated under similar conditions. Among those bodies experimented upon were sugar, starch, gums, chlorophyll, and resinous and fatty substances of vegetable origin. By prolonged heat combined with pressure these bodies were converted into substances offering a certain resemblance to coal. They were of a brilliant black, frequently fused, insoluble in neutral acid or alkaline solvents, and, when exposed to a red heat, gave off water, gas, and tar, leaving as residuum a hard and brilliant coke. The chemical analyses of these substances confirmed their resemblance to coal, as may be seen from the following examples:—

	Carbon.	Hydrogen.	Oxygen.	Ash.
Coal made from sugar . .	66·84	4·78	28·48	—
Coal made from starch . .	68·48	4·68	26·84	—
Coal made from gum arabic	78·78	5·00	16·22	—
Pit coal from Blanzy . .	76·48	5·23	16·01	2·28

These three substances were chosen for experiment, because, being most abundant in the vegetable kingdom, they probably played an important part in the formation of coal. But, although these bodies were so easily converted into coal, it remained to be explained how the tissues of plants could be changed into the same substance. A clue was given by the analysis of pieces of fossil wood, which were found to contain considerable quantities of ulmic acid. This acid exists also in peat, and may be produced from the vasculose contained in wood. In order to ascertain the influence of ulmic acid on the formation of coal, it was exposed to a high temperature in closed vessels. The following analyses show that the percentage of carbon increased with the duration of the experiment:—

	Carbon.	Hydrogen.	Oxygen.
Coal made from ulmic acid heated for 24 hours . .	67·48	5·84	26 68
Coal made from ulmic acid heated for 72 hours . .	71·72	5 03	23·25
Coal made from ulmic acid heated for 120 hours . .	76·06	4·99	18·95

Like natural coal, the substance produced was insoluble.

Ulmic acid produced from vasculose was remarkable for its fusibility; this may account for the similar property of bituminous caking coals. On treating leaves with alcohol, various substances, such as chlorophyll, fatty bodies, and resins are extracted. When these were heated together for 150 hours, a mass was obtained closely resembling natural bitumen.

The above experiments render it highly probable that the plants which gave rise to coal first underwent a species of peaty fermentation, during which they lost their organic structure. The peat thus formed became gradually converted into coal by the combined action of heat and pressure.

MARPLE (CHESHIRE) WATER SUPPLY.—At a meeting of the Marple Local Board on Monday, the 20th inst., two schemes for supplying Marple with water were brought forward by Mr. Alfred Moore, of Manchester, and the Board decided to adopt the Cobden Edge scheme, the estimated cost of which was set down at £13,517.

THE SANITARY CONGRESS AT CROYDON.

In this age, when "congresses" are an established institution, and sanitary science is deemed essential to human happiness, a Sanitary Congress appears almost inevitable. A gathering of this nature has just been held at Croydon, under the auspices of the Sanitary Institute of Great Britain—a society of recent origin and growing vigour. The Congress was a very respectable affair, conducted after the fashion which usually governs such gatherings, and including in its programme an exhibition of sanitary appliances. After an inaugural luncheon, there was an inaugural address, the latter of a nature to amuse as well as to instruct, the speaker being Dr. Richardson. The projector of Hygeia has advanced beyond the limits of an ideal city, and now depicts an entire region, wherein all the sanitary laws are rigidly observed, so as to secure for the population a degree of longevity far exceeding that with which mankind are now familiar. Everything in "Salutland" accords with the highest teachings of sanitary science, and some of the arrangements go yet farther. Not only is the climate itself conformable to all that the sanitarian can desire, but the inhabitants are harassed by no wars, and are free from countless vexations which, by the mental fret they occasion, have a tendency to shorten human life. There is no hurrying to "catch the train," for railways are superseded—in respect to the passenger traffic—by the circumstance that aërial locomotion is *un fait accompli.* If terrestrial transit should be thought desirable in certain cases, there are roads maintained in a state of the most perfect efficiency, traversed chiefly by equestrians and bicyclists. Everybody can ride, and everybody can keep either a horse or a bicycle. There are no workhouses and no gaols, and—what may be better still—there is "no centre of government," so that all fear of centralization will be removed from the minds of the inhabitants. Possibly there will be no rate collectors. The taxes, we may hope, will be met by voluntary contributions, aided by liberal bequests when people happen to die, which will be but seldom. One drawback consists in the fact that coal will be dear. Meat might be cheap, but the inhabitants will be too refined to eat it, having a horror of such semi-cannibalism. Of course, there will be no Water Companies or Gas Companies, such relics of barbarism having long previously been disposed of. There will not be so much as an Omnibus Company, with ponderous "busses" to disturb the public peace by rattling along the roads. Everybody will be so happy and healthy, that the *raison d'être* for a Sanitary Institute will be gone for ever, and a Sanitary Congress felt as a solecism.

Dr. Richardson is quite right in his implied principle that many things go to make up health. Overwork and frequent "worry" tend to shorten life. Sanitation, true and complete, requires something more than perfect drainage and pure water. Dr. Richardson considers that if all things were favourable, men would live to one hundred or even to one hundred and twenty years. But all things are not favourable, and we doubt whether even Salutland would suit everybody. Its dull and inglorious life, with everything to enjoy and nothing to fight about, would be death to some people. With no real troubles to call for the exercise of fortitude, the Salutlanders would lapse into a nation of hypochondriacs. If human beings are to enjoy perfect health, human nature must itself be perfect. In the meantime, we must take things somewhat as they are. The Sanitary Congress at Croydon—excepting the luncheon—commenced with a dream—a very pretty one of its kind, but still a dream, and one which cannot possibly be realized. One idea which showed itself in Dr. Richardson's address was that large towns are inherently unfavourable to health. Thus he would limit the size of towns to 100,000 inhabitants. This is a generally-accepted principle, and is very clearly laid down by Dr. Farr. Taking the 619 districts of England and Wales, and dividing them into eighteen groups, according to the rates of mortality, Dr. Farr shows that this rate increases with the density of the population. At one end of the scale the deaths per thousand per annum over a series of ten years amount to 15, while at the other end of the scale the death-rate is 39. In the former instance there are twelve acres to each individual; in the latter only the hundredth part of an acre. Dr. Richardson would allow no more than 25 persons per acre in the densest part of the cities in Salutland. Dr. Farr shows that where the English death-rate is 17, there are 166 persons to the square mile; and where it is 39, there are 65,823 persons to that area. Thus the principle is held to be demonstrated that "the nearer people live to each other "the shorter their lives are." Where the people stand 147 yards apart, the mean duration of life is 51 years; where the proximity is 139 yards, the mean lifetime is 45 years; where the proximity is 28 yards, life averages 32 years, and where the interval is only 7 yards, the mean duration of life becomes 26 years.

Three years ago the people of England stood, on an average, 93 yards apart. This distance is lessening every year, and consequently the health of the people should be declining. But this is not the case. Huge aggregations of humanity constitute our large towns, and there is a continual increase of the urban population. Yet the health of the people seems rather to improve than otherwise. Never had England so large a population as now, and never were the people so generally gathered into large communities. We may go back to the period of which Captain Galton spoke at Croydon, when the population of the whole kingdom was only equal to the present population of the Metropolis. "Proximity" then was very broad; yet it was then that the Plague ravaged England as well as other parts of Europe, and the general death-rate appears to have been much higher than it is now. Although the massing of people in large towns is not in itself favourable to health, yet the quickened intelligence which is associated with such development leads to improvements which help to counteract the unfavourable conditions. Towns created the sewage difficulty. The science necessary to cope with that problem has brought about a degree of enlightenment which benefits both town and country. If we were not so numerous, and our towns were not so large, we should not have a Sanitary Institute, or a Sanitary Congress, or anybody to excite our enthusiasm by a picture of Salutland. Dr. Richardson himself will allow that in this respect, as in others, there is "some "soul of good even in things evil."

The domain of sanitary science is necessarily wide. The influences affecting human health are numerous, and in some respects remote. They come down to us from past ages in the form of hereditary disease, and they reach us from distant countries, like the plague of the Middle Ages and the cholera of modern times. We take poison with our food; and typhoid fever on a farm a hundred miles away may seize us at our breakfast-table. In like manner Dr. Alfred Carpenter tells us that before English people can have that perfect health which is the birthright of every child born into the world, it will be necessary to alter our plans with regard to the breeding of cattle, and the methods of housing and feeding them. "All sanitary law," says Dr. Carpenter, "is, as a rule, "ignored by the farmer." The animals he keeps are housed in a foul atmosphere, and are supplied with foul water, and are fed on musty food. This is not as the poets sing, but it is to a certain extent true. Knowing something of "the customs of the country," Dr. Carpenter declares he was not surprised when he heard an Inspector from the Metropolitan Meat Market state upon oath, in the Croydon Police Court, that 80 per cent. of the meat sent to the London market was the subject of tubercular disease, and that to exclude it from the market would be to leave London without a meat supply. Some people write and talk as if disease and death would be almost unknown, if only the water supply of towns were rendered pure according to their notions of purity. But we learn from the Croydon Congress, as from other sources, that a great many things require to be set right independently of any considerations about the water. Thus we are told, "We cannot remove disease from our midst, or "reduce our death-rate much below 17 per 1000, until we can "ensure a more healthy progeny among our domestic animals." So also we must be careful as to the ventilation of our dwellings and public buildings. The air we breathe must not contain so much carbonic dioxide as 450 parts in a million, and we must induce the requisite currents, so that there shall be a fresh supply of oxygen to alter the chemical characters of the albumenoid matters given off by living creatures. These and many other conditions must be observed, if we desire to live healthy lives.

Local Authorities were not held in very high esteem at the Croydon Congress. For this reason we might expect the moving spirits of the Sanitary Institute to be less sanguine than some others as to the advantage of transferring to the Local Authorities the undertakings of the Water Companies. Dr. Richardson observed that the first principles of sanitary law are often in antagonism to private interests. Thus these principles are frequently "opposed to the pecuniary advantage "of the few," and these few "are also, at times, themselves "the mainspring of local authority." Consequently, "It is not "surprising to find unsparing efforts constantly made by "interested individuals to show that the first principles are "wrong." The Sanitary Institute seeks to enlighten the ratepayers as to the conditions of health, so that they may elect properly-qualified persons to represent them at the Local Boards. In this way it is hoped to "check the consummation

"of some of those gigantic jobs which are sometimes carried "out in the name of sanitary science, but which are only "started for the purpose of benefiting some private indivi- "dual." The audience cheered the declaration, so we suppose they both understood and appreciated it. Worse things could not be said of a Gas Company or a Water Company. The fact that Local Authorities can sometimes go wrong is seldom taken into account when the water supply is under discussion. Had the water supply of London been in the hands of the Local Authorities from the first, we wonder what the cost would have been by this time, and what would be the general nature of the arrangements.

We further learn from the Croydon Congress that prisons under Government control are probably the healthiest residences in the kingdom. This scarcely shows that honesty is the best policy; and we may perhaps doubt whether prisons would exhibit so low a death-rate if they contained infants and children in the proportion in which they prevail in ordinary life. Granting that prison arrangements are really conducive to health, we question whether institutions conducted on such principles would find voluntary occupants. The fact is somewhat illustrative of Salutland. If human life were regulated as by clockwork, everything being carried out according to a fixed code, longevity might ensue. But the process would be insufferable, and just as people break out of prison when they can, so the dwellers in Salutland would inevitably fly from their healthful but monotonous abode. Sanitary law, rigidly enforced, would diet us, and regulate us, and make us march to and fro, as if the one great object of life were to live, and the utmost care were requisite to ensure that we should not die one hour short of our proper maximum. Still, we trust some good will come of all this sanitary talk. We are not going to surrender our liberties in order to reduce the death-rate; but we trust that liberty and longevity may be deemed perfectly compatible. There is a long step between the reckless disregard of all that relates to the laws of health, and the slavish fear of inhaling disease, and perhaps death, with every puff of air and drop of water. Mr. Symons disposed of one bugbear in his address on "Meteorology and Geology," by showing that it was possible to have a healthy dwelling on a clay soil. This gentleman expressed his desire for further means of investigation. The quality of the air is not to be readily ascertained in all cases, and Mr. Symons declared "it was "too bad" that there should be no easy means of determining the relative life-supporting properties of the air in Hyde Park and Seven Dials. "The old-fashioned ozone papers," though useful, were pronounced insufficient. Meteorology has a pretty good array of instruments by this time; but something more is wanted.

The registration of sickness as well as death is a matter much in demand by those who take special interest in the public health. Mr. Symons looks forward to a time when—the proper data being available—we shall have disease signals, just as we now have storm signals. Let us hope there will be no alarming telegrams, per cable, from New York, telling us that scarlet fever and diphtheria, veering round into bronchitis, may be expected to "strike British and Norwegian "coasts" in the course of the ensuing week. We have suffered quite enough in the meteorological line during the present year to make us wary of any proposals for extending the system of forecasts to an epidemiological department. The weather chart, with its dotted isobars, is quite enough for the daily study of ordinary mortals, without the appendix of a zymotic chart, rendered terrible by scientific zig-zags representing the subtle progress of unnumbered germs. Mr. Symons thinks something of the kind would be "useful." Perhaps it would be so, and we can only hope that by the time it is invented people will have the nerves to stand it. When the year of grace has arrived in which we are wise enough to scent disease in the air, perhaps we shall be able to stamp it out altogether. Pending that consummation, we must make the best we can of ordinary precautions, many of which are scandalously neglected. Already we are told that when typhoid fever breaks out, somebody ought to be shot. Who is the proper person to shoot? Perhaps the Sanitary Institute will tell us. It might be a landlord—of "small "property," not in Ireland, for that is not part of "Great "Britain," though the state of things in Dublin seems to call for a Sanitary Institute and a Congress quite as loudly as anything on this side of St. George's Channel.

Sale of Shares in the Great Yarmouth Water Company.—On Thursday, the 16th inst., 500 preference shares of £10 each in the Great Yarmouth Water-Works Company, carrying interest at the rate of 5 per cent. per annum, were sold by public auction in Yarmouth, at premiums of 21s. and 22s. per share.

WELLS AND RIVERS AS SOURCES OF WATER SUPPLY.

We pointed out in last week's Journal that there are really very few large towns in which well water is used, almost all the great centres of population being supplied from the surface with water collected over a watershed of greater or less extent, varying according to the rainfall, the form of the country, and the mode in which the water is stored. In its way along the surface to the reservoir, it is simply impossible, in a peopled country, that flowing water should be protected from the presence of human beings, as the ground must be occasionally, if not systematically and uniformly visited, even if no part is inhabited. So also is it with reservoirs covering several acres of ground, and receiving from the hillsides that enclose them the washings of the surface. In all these respects reservoirs and lakes are identical, and there is no conceivable reason for excluding from use one rather than the other. Manchester and Salford, with their populous suburbs, have long been satisfied with water collected miles away on the western slopes of the Pennine chain, close to a line of railway and road over which there is enormous traffic, and near which scores of human beings daily pass. The inhabitants are now authorized, when additional quantity is needed, to have recourse to a lake. Liverpool, with its half million of human beings, supplied, to a large extent, from reservoirs miles away, is in need of increased quantity, and will probably end by impounding the early waters of a great river, or converting some distant lake into a reservoir. No practical alternative now remains. Leeds and Sheffield, Bradford and Huddersfield, Halifax, Bolton, Oldham, and Blackburn, are all in the same case, all being supplied with water from similar sources, admitted to be of unimpeachable quality, but subject to whatever evils may happen to water allowed to run over the surface and be collected in a reservoir. The universal judgment of chemists is favourable to such waters, but it is perfectly clear that they have been exposed to whatever amount of pollution is due to the occasional, if not constant presence of man. Should there have been, in their vicinity, cases of diarrhœa, typhoid fever, or any other diseases, the seeds of which can be conveyed by water, there is nothing to prevent these diseases from being introduced by the water supply, and decimating the towns subject to the infliction. We all know, however, that no such result is obtained. Zymotic diseases occur in these towns, but as the water is universally distributed throughout them all, and the diarrhœa or fever is always localized, it is clear that there have been other causes operating to produce the result.

Now, in what respect does river water, taken under proper and favourable conditions, differ from the water stored in reservoirs? It is evident that this is a very important practical question which must be answered. In the first place, it can only differ in degree, not in kind. Each is derived from the same source, each is subject to the same class of injuries, each is purified by the same chemical process. There is no reason, in the nature of the case, why water that has flowed ten or twenty miles into a reservoir should differ from water that has travelled sixty or eighty miles along an open channel, or water that has sunk through five hundred feet of strata, and been lifted back to the surface. They *may* differ, owing to the influx of impurities and foreign substances introduced, or the extent of purification; but in the case of rivers to be used for supply, such injurious substances must be excluded. If they are so excluded—and it is perfectly possible to do so—the river water should be in all respects as good as that from the upper sources, or the well.

It has sometimes been stated very positively, and from authority, that water once rendered impure by the intrusion of sewage matter cannot afterwards be trusted, and this objection lies at the root of all those outcries made against river water in the abstract. But we have seen that the water collected in reservoirs must inevitably be subjected to influence of that kind, and is yet reported as of first-rate quality. Practically all chemists, even Dr. Frankland and his school, admit that oxidation takes place on exposure, removing impurities, and reducing the organic nitrogen into harmless nitrates. This must be admitted, or we are forced to accept the absurd conclusion that all water whatever is dangerous or poisonous. If not the latter, it must be the former. All flowing water has at least had a chance of being polluted, and in most cases has been so. Much of it, however, is clear, bright, cool, pleasant, and wholesome. This can only be the result of oxidation, and oxidation is certainly a process that goes on in all running water.

But, if the water flowing in rivers differs only in degree from that impounded in lakes or reservoirs and that raised from the strata, it must be left for analysis or experience to

decide whether a particular water is fit for supply. Dr. Tidy last year published in a convenient form the general result of a series of analyses of the waters delivered to the Metropolis by the various Companies, taken monthly for ten consecutive years ending in 1877, and the mean of analyses of Thames water at Hampton, taken monthly, during the four years ending at the same time. The following are the mean results expressed in grains per gallon :—

Constituents, &c.	Five Companies drawing Water from the Thames only.*	Two Companies drawing Water from the Thames and River Lea.†	River Thames at Hampton.	One Company (the Kent) drawing Water from Chalk Wells.
Ammonia, saline	0·002	0·001	0·002	—
Do., organic	0·007	0·0045	0·008	0·003
Nitrogen as nitrates	0·132	0·126	0·132	0·250
Oxygen required to oxidize the organic matter	0·076	0·045	0·096	0·011
Total solids	19·320	19·32	19·68	27·690
Chlorine	1·074	1·055	1·008	1·551
Hardness, temporary	14·23	14·28	14·6	20·06
Do., permanent	3·6	3·59	3·5	5·74

* These are the Grand Junction, West Middlesex, Southwark and Vauxhall, Chelsea, and Lambeth Companies.
† These are the New River and East London Companies.

The difference in the quality supplied by the various Companies is altogether unimportant, and the improved condition of the water delivered over that of the river is due to filtration, and might certainly be increased. The quality of the water is so good as to prove the great extent to which oxidation has been carried; but it may fairly be expected to become even better when the measures recently taken by the Thames Conservators shall have borne fruit. During the time to which these records refer, the various towns on the feeders of the river, and even many of those on the main stream, were in the habit of sending a large quantity of sewage into the river. It is now altogether excluded.

Such a condition of water would, at any other time and in any other place, be regarded as unexceptionable. It would be in the Metropolis, were it not that a comparatively small district in the south-east of London, including some outlying thickly-peopled suburbs, is supplied with water from chalk wells. This district extends from Camberwell to Dartford in one direction, and from the Thames to Chislehurst and Bromley in the other. The population is about a quarter of a million. The supply is from nine wells, eight of them from 150 to 250 feet deep, and one 500 feet, each being lined with cast-iron cylinders to the depth of from 70 to 100 feet. The effect of these linings is only to keep out for a time such surface sewage as exists near the well. Although there are nine wells, some of them are near together, draining from the same source, and practically there are but seven sources. One of these (Belvedere) yields water containing 1·126 grains of nitrogen as nitrates and 2·24 grains of salt per gallon, and requiring 0·034 grain of oxygen to oxidize organic matter. Another, and that the deepest (Plumstead), has 0·323 grain of nitrogen and 6·13 grains of salt. The others, except Shortlands, require 0·004 to 0·019 grain of oxygen to oxidize organic matter, and contain 0·248 to 0·350 grain of nitrogen as nitrates. They contain from 22⅓ to 28½ grains of solid matter to the gallon, and are very hard, varying from 15° to 24½° on Clark's scale before boiling, and 3° to 7° after boiling. The Plumstead water has 11·6° of hardness after boiling. Besides the nine wells used for pumping from, there were others sunk of which the quality was objectionable, and which are not used. The quantity pumped varies from 200,000 gallons per day at Belvedere to 4½ million gallons at Deptford. The above figures are quoted from Dr. Tidy's report already alluded to.

It is impossible not to be struck with the extraordinary difference of condition of the water in the chalk near London to the south-east, as well as the different yield of wells sunk to the same, or nearly the same depth. It is similar also and to a still greater extent, north of the Thames, as has long been known to well-sinkers. The water obtained is neither always abundant nor always drinkable. It is always hard when good, often hard and bad, and sometimes soft and bad. No doubt occasionally, as at Shortlands and Deptford, there are wells that yield good water abundantly, but such wells are few in comparison, and form the exceptions and not the rule. The number of wells that yield three million gallons per day of good water has always been exceedingly limited. The average quantity of water supplied by the Kent Water Company from the whole number of wells sunk, nine of which are pumped from, is a little over seven million gallons per day. The total quantity, however, supplied daily to London is about 112 millions. Two out of the number of the Kent Company's wells yield quantities altogether exceptional, and indeed rarely equalled in any rock, and the Company are also fortunate enough to possess three others, which must be regarded as very successful and fortunate sinkings. The whole drain an area of between thirty and forty square miles, situated not far from the Thames, and crossed by the Rivers Ravensbourne and Cray, which flow over the chalk, and supply doubtless a large quantity of water to the chalk in this district. These facts regarding the sources of supply of the Kent Water-Works Company, as compared with those of London generally, are not to be lost sight of when chalk water is suggested as the proper supply for London; but they by no means indicate that it would be easy, or even possible to multiply the yield fifteen times, by sinking fifteen times the number of wells in the five hundred square miles of chalk round London.

Communicated Article.

ON THE EFFECTS OF THE CONTACT OF TAR WITH COAL GAS.

By Mr. R. H. Patterson, F.S.S., late Metropolitan Gas Referee.

PART III.

In 1874, two years before Mr. Young read his first paper in this country, Farmer's Zig-zag Condenser, or Tar Scrubber, was brought out in America, and in the autumn of that year it was adopted at the New Haven Gas-Works, U.S. The opinion then in vogue in this country as to the valuable results to be obtained by prolonging the contact between the gas and its deposited tar—an opinion which is really erroneous—had crossed the Atlantic, and was generally accepted by American gas managers, and indeed by Mr. Farmer himself. But he stated that in devising his tar scrubber he sought to apply the principles laid down by Mr. Bowditch.

In a paper which he read before the American Gaslight Association, on Oct. 18, 1876, Mr. Farmer, stating the opinion then in vogue both in this country and in the United States, said that "the majority of gas engineers have for some time been fully convinced that the gas and tar should be kept well in contact, for a certain time, immediately after they leave the hydraulic main;" and that, with this object, "some engineers carry the gas two or three times round the retort-house walls, in mains which are hung on the walls of the house;" but that no efficient apparatus had yet been devised for achieving the object in view—namely, "improving the illuminating power of the gas by taking up the lighter hydrocarbon vapours" from the tar. He then referred to Mr. Graham's Coil Condenser, and, besides claiming a superiority for his own apparatus on the ground of its compactness, he maintained that the defect in previous processes and apparatus was that, "the gas is not kept thoroughly in contact with the tar." This last clause in Mr. Farmer's remarks hardly does justice to his real opinions. Merely to bring the gas and tar into closer contact would be much more likely to destroy the illuminating power than to improve it. All depends on the manner and conditions under which the contact is made. Temperature is everything in the matter; and Mr. Farmer himself, in other parts of his paper, recognizes, although not adequately, the importance of this truth.

His apparatus—or, to give it its full title, "the Smith and Farmer Condenser and Scrubber"—is really a tar scrubber, through which the gas is passed in such a manner as to produce the most thorough contact between it and the tar which is possible without creating an intolerable amount of back pressure. It consists of a perpendicular framework (it may be likened to a window-frame) filled in with horizontally-arranged plates, each about 6 inches in width, and placed about 2 inches apart; and the plates are placed slanting, or diagonally to the frame. This apparatus or latticed framework, says Mr. Farmer, "should be placed as near to the hydraulic main as possible;" and adds, "in a warm building"—I presume simply in the retort-house, where it must necessarily be placed if in immediate juxtaposition to the hydraulic main. But he makes no mention of *heating* the apparatus; and I fail to see how the apparatus (as he says it does) "keeps the *hot* liquor much longer in action than any other." It certainly seems as if the gas and tar would cool in passing through the framework quite as much as in the ordinary mains on the inner face of the retort-house walls. Having passed through the apparatus, the gas is passed into "the ordinary multitubular condenser to be reduced to the proper temperature before it enters the water scrubbers."

This Zig-zag Condenser or Tar Scrubber, I believe, is nowhere in use in this country; accordingly, in order to ascertain its merits and operation, I must take the experience obtained of it by American gas managers. At their meeting in October, 1876, the American gas managers gave their attention chiefly to the merits of the zig-zag condenser for preventing deposits of naphthaline, and not specially to the main object of Mr. Bowditch's recommendations—namely, the increased illuminating power to be obtained by keeping in the gas the lighter and more volatile hydrocarbons. Graham's Coil Condenser was also referred to by two speakers. The secretary, who had "some four or five" of these coil condensers in his works, stated that they did very well as ordinary condensers (*i.e.*, for cooling the gas), "but as for taking out naphthaline," he said, "I do not believe they are worth a penny;" and Mr. Rollins, likewise speaking from his own experience, said, "as a preventive of naphthaline I do not think it is worth a cent." On the other hand, the zig-zag condenser was highly commended as a preventive of naphthaline deposits by Mr. Sherman, of the New Haven Gas Company, who, at that

time, had had two years experience of the apparatus. He said, "We had over 50 complaints a day previous to putting it up in October, 1874. The works were completely choked up with naphthaline, and the inlet and outlet of the holders were filled with it; but the complaints, of course, came principally from the consumers. Since then, without any change in the coal, we have not been troubled at the works; but we have still about three complaints a day from consumers—which is a very small number considering we have 6000 consumers."

This is highly satisfactory as regards *deposits* of naphthaline, but it leaves open the important question, What became of the naphthaline? Was it upheld in the gas, or was it taken out by the contact between the gas and tar in the zig-zag? Mr. Bowditch stated that, by observing the principles of condensation which he laid down, the gas would be so enriched by the light hydrocarbons (ordinarily deposited along with the tar) that it would be able to *uphold* in itself a considerable portion of the naphthaline—to which extent, of course, naphthaline deposits would be prevented. This is an entirely different thing from preventing such deposits by *taking out* the naphthaline; yet, so far as Mr. Sherman's above-quoted statement goes, the latter result is quite as likely as the former to be the explanation of the cessation of naphthaline deposits from using the zig-zag condenser.

It is unfortunate that the great difficulty with naphthaline deposits should have turned the discussion almost entirely to this matter, rather than to the question how far the zig-zag is successful for keeping in the gas the light hydrocarbons usually deposited along with the tar. Indeed, when asked "whether this tar scrubber affects the candle power of the gas," Mr. Sherman answered that "he did not know what they were making before the apparatus was put in." Nevertheless, he had previously stated that when he "took charge of the works [date not mentioned], we used about 30 per cent. of cannel coal; during the last year we have not averaged 8 per cent." It is to be regretted that Mr. Sherman had not paid more attention to this most important side of the question; but it certainly appears from his experience that the zig-zag tar scrubber does to some, and it may be a great extent accomplish the object of Mr. Bowditch, in preventing a loss of the lighter hydrocarbons. At the same time it is not safe to rely upon evidence like this; and we should be glad if American gas managers would give their enlarged, and we trust more carefully observed experience of this apparatus.

In the United States, this zig-zag tar scrubber is employed not only immediately after the hydraulic main, but in some works after the condensers; and speaking of the apparatus, in a recent series of articles on Naphthaline, I said that, whatever might be its operation when employed in the former of these positions, its effect must be detrimental to the illuminating power when it is placed after the condensers. When placed next to the hydraulic main, both the gas and the tar are warm; whereas, when placed after the condensers, both the gas and tar must be cold. And, if there be any truth at all in our present knowledge, to wash cool gas with cold tar must certainly be detrimental to the illuminating power. As stated in my last article, Mr. Bowditch found that passing gas through cold tar reduced its illuminating power from 13 candles to 1; and Mr. Young has found and shown the same results. Nevertheless, with reference to the opinion to this effect which I expressed in my Naphthaline articles, Major Dresser, the Editor of the *American Gaslight Journal*, wrote to state that this was not the case, and that no loss of light was experienced from the use of the zig-zag scrubber, however placed. The gist of Major Dresser's letter was, that the washing of the gas with tar in this apparatus in no case impairs the illuminating power, and in some instances considerably improves it; but the special point in his statement is, that there is no loss of illuminating power even when the apparatus is employed after the condensers—that is, when both the gas and the tar must be cold.

In support of this statement, Major Dresser says that in some of the New Haven gas-works, "where the zig-zags are placed just after the hydraulic main, the result of their introduction was the disappearance of naphthaline from the service-pipes throughout the city, and an increase of illuminating power." This statement evidently applies to the same gas-works of which Mr. Sherman gave his experience at the meeting of the American Association in October, 1876, and is quite in accordance with Mr. Sherman's report upon the zig-zag, which we have already quoted. But in both cases there is a lack of actual experiments or definite proof. It seems certain that the zig-zag greatly lessens (Mr. Sherman says expressly that it does not entirely prevent) deposits of naphthaline; nor can we believe that both Mr. Sherman and Major Dresser are mistaken, when, speaking from their own experience, they say that the apparatus improves the illuminating power of the gas. Therefore, it seems plain that the zig-zag is a real improvement—and it was the first of its kind. But if we ask *how much* the illuminating power is improved, and by what tests this was ascertained, the answer is very unsatisfactory; for Major Dresser's only statement on the subject is, that "the New Haven works obtained better results from their coal (*i.e.*, the yield per pound being multiplied by illuminating power) than *almost* any other works in America." Now, it need not be said that a difference of product may be owing to several things besides the use of the zig-zag condenser—to difference of retort-settings, or other points in distillation; nay, more, the removal of the carbonic acid (as has recently been found in London) gives a marked and valuable increase in the amount of illuminating gas.

Still, we repeat, it seems beyond doubt that the zig-zag gives good results when placed immediately after the hydraulic main. But I must take leave to doubt Major Dresser's statement that this apparatus increases the illuminating power of the gas when it is used after the condensers—when both the gas and tar are cold. Major Dresser says, "In another large gas-works in the same city [New Haven], the zig-zag is used after the condenser, and in this case the illuminating power was not diminished, but rather improved by the introduction of the zig-zag." And he adds, "There is one fact clearly deducible from this practice—viz., the Smith and Farmer method of treating the gas, *either hot or cold*, by means of their zig-zag scrubbers, does not imperil the illuminating power of the gas." This is quite opposed to the action of cold tar upon cold gas, as ascertained both by Mr. Bowditch and Mr. Young; and, as no reliable tests were employed at the New Haven works, I must take the liberty of remaining incredulous as to the usefulness of the zig-zag when placed after the condensers. Moreover, why should it be placed there at all, when obviously it would do much better next to the hydraulic main?

Although the zig-zag tar scrubber was avowedly designed to carry out the scientific principles laid down by Mr. Bowditch, and also his recommendations or suggestions, I should not have been led to think that this was the case from a consideration of the apparatus. Anyhow, Mr. Bowditch's teachings and suggestions have been most imperfectly carried out by the zig-zag, and I am confident that it will not be accepted as a satisfactory remedy for the evil which Mr. Bowditch was the first to call attention to. It may be—indeed, it appears to be—a meritorious first attempt; but that is all.

The case is very different as regards the analyzer devised by Messrs. Aitken and Young. This apparatus was brought out somewhat later than the zig-zag, but it borrows nothing from it, and it differs from it in being a most intelligent application of the facts and principles brought to light by Mr. Bowditch, and subsequently to the first patenting of the analyzer discovered anew or re-ascertained by Mr. Young. There is intelligent design visible in the whole apparatus. Both the gas and the tar are kept hot—indeed, at a higher temperature than could possibly be obtained at any stage of the ordinary course of purification; and also there is, to a considerable extent, a "fractionating" of the gas and tar, in order that the gas, at the point where it is meant to absorb and re-incorporate the light hydrocarbons (at first deposited with the tar), should be in a suitable condition for doing so.

The application to gas manufacture of the long-used chemical apparatus termed an "analyzer" was first patented by Mr. Aitken, coal-master, of Falkirk, in 1874; and in the following year, 1875, the analyzer as it now stands was patented by Messrs. Aitken and Young conjointly. The apparatus has been described in previous numbers of the JOURNAL, and it amply deserves to be brought anew under the attention of gas managers. But first—not in any detraction of the merits of its patentees, but in simple justice to Mr. Bowditch, whose name ought to be held memorable in gas history, and who shares with the unfortunate Mr. Heard the distinction of being the only chemists (and Mr. Bowditch was a chemist from taste, not by profession) who have ever devised anything really useful in gas manufacture—we must see what Mr. Bowditch, who was the first to discern the great defect in gas condensing, suggested by way of a remedy and improvement. He says in his book (pp. 7–8):

> We must resort to a carefully-conducted artificial process. . . . A special apparatus, kept at a regulated temperature, should be interposed between the hydraulic main (in this case kept hot, of course) and the purifying apparatus, in which the gas and lighter hydrocarbons might be separated from the heavier bodies; and so a large proportion of hydrocarbon vapour might be distributed with the gas; in other words, the gas might be made more illuminating. . . . Mr. Warren's "condenser" will explain how this is best accomplished. That gentleman uses an ordinary coil of pipe, but, instead of keeping it *cool*, he keeps it *hot*; and, instead of sending the vapours into the top, he sends them into the bottom of the coil, and compels them to ascend. The coil is *heated* to the boiling point of the volatile substances which he wishes to separate. The mixed vapour from the retort [analogous to the crude gas] is sent into the lower part of the coil, and in its passage upwards the *vapour* is distilled; the more volatile compounds pass on, to be condensed in the ordinary manner, and the less volatile ones condense in the heated pipe, and fall back into the retort. *This beautiful arrangement points out what ought to be done in condensing coal gas.*

In Mr. Aitken's specification the preliminary facts are stated thus:

> It is well known that illuminating gas is principally indebted for its illuminating power to volatile hydrocarbon vapours diffused through it, and that *similar* vapours are abundantly contained in the tars. . . . I have found that the treatment of the crude gases at present practised is wasteful, and greatly deteriorates the illuminating power of the gas; for, by the present treatment, the *cooled heavy tars* mechanically carried forward and brought into contact with the *cooled gases*, have the property of absorbing the very volatile hydrocarbons, which, if allowed to remain in the gases, would have much improved their illuminating power.

Thus Mr. Aitken found in 1874 exactly what Mr. Bowditch had found and ably set forth in 1867. And the object of the invention, it need hardly be said, is the same as that proposed by Mr. Bowditch—namely, "to enhance the illuminating power of gas by "improved methods or means of treating the crude gases, whereby "they are enabled to retain, or to be saturated with, the volatile "hydrocarbon vapours and rich gases, which by the ordinary methods "of making [condensing?] illuminating gas are absorbed by or "carried off in the tar."

I shall next show the manner in which this object is carried out by Messrs. Aitken and Young's Analyzer, and the successful results which have recently been obtained from their apparatus.

LEEDS CORPORATION WATER-WORKS.—The Fewston reservoir, which completes the Leeds system of water-works in the Washburn Valley, is now completed, and on Monday next it is intended to open the sluice through which the water will flow into and fill the reservoir. This ceremony will be conducted by the Mayor (Alderman Addyman), on the invitation of the Water-Works Committee. Mr. Hawksley, the Chief Engineer, will be present; and entertain the Corporation to dinner.

Correspondence.

[*We do not hold ourselves responsible for the opinions expressed by Correspondents.*]

STATION-METERS.

SIR,—In the JOURNAL of Aug. 26, in the "Circular to Gas Companies," there are the following remarks about station-meters:—

"We quite agree with Mr. Terrace, that *per se* the indications of a station-meter are of very little value in estimating what may be called the good management of an undertaking. So many things require to be taken into consideration before it can be said that the production of gas is satisfactory, that we may regard the operation of the station-meter as delusive rather than satisfactory. If the coals are not always of the same quality, and even if they are, the quantity of gas obtained must necessarily vary. Little irregularities in the retort-house, which the manager, unless he is always on the spot and does the firing himself, cannot control, will also largely affect the results. Then, as Mr. Terrace says, the station-meter may be too small, and overdriven; hence large errors in registration. So that it is really useless to attempt to draw any conclusions as to the good or bad working of undertakings from the registration of a station-meter."

When I first read these remarks, I thought that some gas engineer or gas-meter maker, who could speak with authority, would be sure to take notice of them; but as several numbers of the JOURNAL have been issued since, without this being done, and I feel strongly, for reasons which hereafter appear, that they ought not to be passed over in silence, I take upon myself to write, though my limited knowledge of the subject will not permit me to do so as thoroughly as I could wish.

I fully understand that the remarks are intended to apply to station-meters only, but as consumers do not know that station-meters are not constructed in exactly the same way as others, they will suppose, if these statements are allowed to pass uncontradicted and without explanation, that the remarks apply to meters generally, and that large errors in registration are (as it were) unavoidable and matters of every-day occurrence; and nothing could be more prejudicial to gas interests than for such an opinion to gain ground with consumers at the present time. But, so far as I have been able to ascertain, there is no just cause for such a statement, even as respects station-meters, which can, I am told, be made by a careful manager to register the quantity of gas passing through them with even greater accuracy (if the term is allowable), and not less than an ordinary meter. Every manager must have on his own works the means of proving whether his station-meter registers correctly or not; and, if it does not, he ought to have it removed, and another that will do so fixed in its place. When the registration of the meter cannot be depended upon, all results, whether good or bad, are unreliable and open to doubt. The manager, therefore, owes it to his own reputation to have a meter that will register correctly. Apart from this, however, the point which is of the most importance to the companies is the effect that such observations, if uncontradicted, are likely to have upon consumers, and it is on this account that I desire to direct attention to them.

Parliament, in order to secure accuracy of registration in gas-meters, for the protection of the public, has prescribed certain regulations for their construction, and the regulations for the wet gas-meter (which is the only meter used for station purposes) are, that the level of the water inside the meter shall be maintained at a certain point; but as it is not possible, under all circumstances, to do this precisely, a certain variation above or below the point is allowed and provided for, and this variation at its extreme point, if above the proper level, will affect the registration to the extent of 2 per cent. against the buyer; or, if below, 3 per cent. against the seller—that is, in favour of the buyer. Beyond this, neither the pressure at which the gas is supplied, nor the quantity driven through the meter, however much in excess of the standard quantity it may be, nor anything else, will affect the registration in the slightest degree, as a meter properly constructed cannot work beyond it. When the water in the meter has once been adjusted at its proper level, it cannot be raised so as to work against the buyer, unless more water is put into it; but it can be, and is lowered, so as to work against the seller, by the action of the meter itself, as the water gradually, though slowly evaporates, and has to be replenished. The accuracy of the registrations is by these regulations as securely provided for as any similar operation possibly could be.

All last winter the weather was cold, wet, and gloomy to a very unusual degree, and in consequence of this, gas, wherever it was used, was turned on earlier, used more freely when turned on, and kept burning a greater number of hours than on ordinary occasions, and this (as had often been the case before) led to an unusually large increase in the consumption. Gas managers knew of this going on day by day, but consumers, who but very seldom look at their meters, did not; and so, when the accounts were sent in at the end of the quarter, there was a loud and general outcry about the excessive charges, and a rush to the papers to complain of the defective registration of the meters.

In London it was very generally said, and believed too by many persons, even in a good position, that the Companies had put on a much greater pressure than usual, and so made the meters go faster, and register more gas than the consumers used. On two occasions, while letters were appearing in the papers almost every day, I was asked in the lobby of the House of Commons—confidentially, as it were—"What do all these letters in the papers mean about the gas companies?" "Is there not some dodgery in the matter, whereby the companies can make the meters go round faster, and register more gas than the consumers actually use?" And times innumerable I had, and doubtless every outdoor servant of a gas company also had, in consequence of these letters appearing in the papers, to contradict many absurd delusions in the minds of the consumers about meters registering more gas than the consumers used.

On one of the two occasions just referred to I said, in answer to the questions put to me, "If the consumers do not use the gas, where does it go to? After passing the meter it must go into the fittings, and if the consumers do not use it, what becomes of it?" But the answer was, "That is not my point. What I suppose—rightly or wrongly—is, that when you put on the pressure, as you call it, you drive the inside of the meter round so fast that it has not time to 'take up' as much gas as it ought to do." I had heard complaints about defective registration from all quarters, but had never before heard so specific and plausible a reason given for it, and was about to say so, when it occurred to me that I had no right to expect that a gentleman whose whole experience of gas matters was limited to the using of it in his own house, was acquainted with the construction of a gas-meter, and that in the absence of such knowledge it was but a natural conclusion that the greater the force at which the gas was pressed into the meter, the faster the interior wheel would revolve.

I explained that, as a matter of fact, the increase of consumption in London was so large, and was continued for so long a time, that it strained all the powers of the Companies to keep the pressure up to the usual standard, and that it was on that account from necessity made lighter rather than heavier, and that putting on a heavy pressure lowered the level of the water inside the meter, and so caused the wheel to "take up" more gas than it ought to do, and not less; or, in other words, that it affected the registration in favour of the buyer and not against him, though only in a very slight degree.

Many thousand persons carry watches, but probably not one in a thousand understands the principle of their construction; and the same may be said of gas-meters. Experience teaches that watches will, at first, work correctly, but that, after a time, they will to a considerable extent go either rather too fast or too slow; and persons unacquainted with the construction of gas-meters, think they act in the same way as watches, consequently every increase in the consumption is attributed to the meter working too fast. If consumers could but be made to understand the principle of a gas-meter, they would have more confidence in the accuracy of the registration, and these groundless complaints of defective registration would disappear. It ought, therefore, to be the policy of gas companies to give to the consumers all the information they possibly can respecting the construction of meters, and try to convince them that, beyond the range allowed by the Act of Parliament, the meter will not act; and not lead them to suppose, as the remarks before referred to are calculated to do, that, by increasing the pressure, or putting on an extra burner or two, the meters may be overdriven, and so cause large errors in the registration.

It is no doubt true, as stated in the remarks, that the registration of the station-meter is not in itself a proof of good management, but that may be said of everything. Good management depends upon many things, all being done well, and dovetailing into each other—quantity being one, and a very important one too; but no one thing, however good it may be in itself, can be taken as a proof of the whole. Of course, when the accounts are made out at the end of each half year (if made out on a proper principle, but not otherwise), they will show whether the management has been good or bad; but then all the operations for that period will be at an end, and the opportunity of correcting will have passed away. It is not, therefore, sufficient to rely upon the accounts alone, the manager requires something to guide him on the way, and tell him day by day how he is working, so that he may correct any defect immediately it appears, and not be groping for months in the dark, unconscious of what he is doing. The best thing he can have for this purpose is a good station-meter.

It is not very easy to determine in an off-hand way what is good management in small gas undertakings, and nothing perhaps is more delusive for this purpose than the dividend. Of two neighbouring companies, one might be paying 10 per cent. and the other only 7, and yet the latter be by far the better managed of the two, from the fact of the former charging a higher rate per 1000 feet than the latter, and more than sufficient to account for the difference in dividend. Or two companies, out of the same prices, might be making an equal amount of profit, but one, by reason of its having a much large proportion of capital than the other, be only able to pay a dividend of 7 per cent., while the other paid 10 per cent. All these things must be taken into account in comparing one Company with another, or the comparison will be but a delusion. Setting dividend and capital aside, large profits out of low prices are, in a rough way, the best proof that can be given of good management.

When a manufacturer gives out to his workmen a certain quantity of raw material, he expects to have returned to him a manufactured article of something like an equivalent value; but small gas companies are content to allow their workmen to take any quantity of raw material (coals) they think fit, and are thankful for anything they can get in return.

In the JOURNAL of the 9th ult. there is a table compiled from the Metropolis Gas Companies accounts for 1878, showing what can be procured from a ton of coals under careful management. Small undertakings cannot, of course, produce such results as these; but, nevertheless, if the managers of small undertakings were, for their own satisfaction, to charge themselves with these quantities for every ton of coals they carbonize, and give themselves credit for the actual results, many of them would be very much astonished at the difference. While admitting that small undertakings cannot be worked so economically as large ones, it is still an open question whether they might not produce something approaching to the same results, though at a greater cost.

W. LIVESEY.

6, *Victoria Street, Westminster Abbey, S.W., Oct.* 24, 1879.

[Our correspondent, we think, entirely mistakes the object of the observations that were made in our issue of Aug. 26. It was never intended to suggest that gas companies had the power to force the registration of meters, so as to show an exaggerated consumption. This has been said in these columns, and in answers to correspondents, over and over again; and we may here once more repeat it. The "errors in registration" by the over-driving of a too small station-meter would be errors of under-registration, not, as Mr. Livesey appears to suppose we meant, of over-registration. In reference to the passage our correspondent quotes, an eminent authority in gas engineering writes us: "It is not only possible that a station-meter can be over-driven, but it is highly probable that many *are* over-driven—that is to say, forced to pass a larger quantity of gas than they are capable of passing if their measuring-wheel or drum made only its normal and proper number of revolutions—100 to 120 per hour. It is well known that if a station-meter drum, or an ordinary consumers meter drum,

exceeds the above-stated revolutions per hour, its registration is incorrect, the indications of the index showing a smaller quantity of gas passed than is actually the case. In other words, *the meter registers slow*."—ED. J. G. L.]

Mr. W. CHEYNE, of Briton Ferry, writes to us in reference to the abstracts of the specifications of two patents published in the JOURNAL of the 14th inst., page 597. As to Messrs. Kirkham and Chandler's patent (No. 1219) for an improved dip-pipe, he says: "I was rather surprised to find the principle of lowering and raising the dip was the same as one of mine (see paper read before the last meeting of the West of Scotland Association of Gas Managers*), and which was in use long before the date of the patent." The second specification Mr. Cheyne calls attention to is that of the patent for which provisional protection only was obtained by Messrs. Wilson and Douglas, for "Improvements in the Construction of Furnaces applicable to the Heating of Gas Retorts, and for other purposes," as to which he says: "The principle of introducing hot air into the furnace is not new, as I have done so with the space I leave at the sides for preventing them wearing out (see paper mentioned above), although I did not state about the hot air, as I did not consider it of any advantage for managers in the North."

Legal Intelligence.

HASLINGDEN PETTY SESSIONS.—MONDAY, OCT. 13.

(*Before Major* HARDMAN, *Chairman; and Messrs.* T. WHITAKER *and* R. TOWNSEND.)

REFUSING TO SUPPLY GAS.

The Haslingden Union Gas Company, by their Manager (Mr. John Sleddon), were summoned for refusing to supply gas to the premises of the Syke Mill Company.

Mr. RADCLIFFE appeared for the prosecution; and Mr. JORDAN for the defence.

Mr. RADCLIFFE, in stating the case, said that the Syke Mill Company were a cotton spinning company carrying on business in Haslingden, and the defendants held the monopoly of the supply of gas within a certain limit. The Syke Mill Company went into liquidation on the 7th of April last, and owed to the Gas Company £79 13s. 7d. for gas supplied. The liquidation proceedings passed, and a compromise was effected under an order dated August, 1879, signifying such an arrangement, whereby the creditors were to receive 6s. 8d. in the pound. This compromise was binding upon all the creditors who did not attend the meeting, and who were in the large minority—that was, there was a large majority of the creditors present who carried the composition, and the defendant Company were bound by that resolution. Some time in August—he was not prepared to say the exact date—the Company cut off the supply of gas from the mill. On the 22nd of September the complainant Company wrote to the Gas Company requesting them to supply the gas. That letter, which was signed by the Chairman and Secretary, was not complied with, and so another request was made on the 25th of September, which stated that unless the gas was supplied on Tuesday morning, the 30th of September, they would try to get it supplied in some other way. It was admitted that these letters were properly served upon the Gas Company. By the 36th section of their Special Act, the Company had the power to recover gas-rents in any court; but the Act under which the liquidation proceedings took place bound the Company in every possible way to the arrangements which were made by the creditors. The creditors of the Mill Company agreed to accept a certain composition, and that bound the Gas Company with respect to all rates. He then quoted cases in support of his statement, and said the Gas Company were adopting the language of the 16th section of the Gas-Works Clauses Act, 1847, which was inconsistent with the 11th section of the Amendment Act, 1871. The 36th section of the latter Act pointed out that whenever the undertakers neglected or refused to supply gas to any owner or occupier of premises entitled to the same, they should be liable to a penalty in each case of 40s. If it was admitted that the notices had been served, it was admitted that the Company had refused to supply gas, and all the facts seemed to be admitted on that point. There seemed to him to be a case beyond argument; the Company having neglected, or absolutely refused to supply gas except upon certain terms, and that was the payment of the debt, which the Gas Company could not recover, as the Syke Mill Company had gone into liquidation and passed the resolution.

Mr. JORDAN, in defence, said there could be no doubt the question raised was of very great importance. It was, whether there was in existence any statute which could authorize the Bench to make an order on the Gas Company to supply gas to the Mill Company or to any other person. His contention was that there was no power. There was no doubt that the Mill Company owed the Gas Company £79 13s. 7d., but he did not care about that. Was there any authority or power to enable the Bench to make an order? He said not. Mr. Radcliffe quoted the 16th section of the Gas-Works Clauses Act, 1847, which was incorporated with the Act constituting the Gas Company, by which they had power to cut off the gas when the rent was not paid. But the question of cutting off the supply did not arise here. The question was, could the Bench make an order compelling the Gas Company to supply gas, and his friend quoted the Gas-Works Clauses Act, 1871, which said, "the Gas Company shall supply gas to any person who shall make application for it." This statute expressly provided that the Act should not apply to any Company formed or constituted before 1871. Now, the Company was established before the year 1871, and he submitted that supposing the 3rd section had not been in the Act at all, the Gas Company would have the right not to supply gas, on the ground that the Mill Company had not paid their rent, and on no other ground. Although nothing turned upon the discussion of the Act of 1847, the 16th section, in pursuance of which the Company acted, had not been repealed. The Act of Parliament expressly provided that whenever any persons neglected to pay their rent, the Company should have certain remedies, which were pointed out to them. The Gas Company had the valuable power to cut off the gas of a customer, and could it be contended for a moment that if the Company cut off the supply, the Mill Company could come to the Court to apply for an order under the 1871 Act to compel the Company to supply them? He rested his case upon this: That the Gas-Works Clauses Act, 1871, under which the present application was made, was not applicable at all, because the Gas Company was formed before the year 1871, and so the summons should be dismissed with costs. As to those points which his friend had been discussing, about the liquidation, they had no bearing whatever on the case.

Mr. RADCLIFFE having again addressed the Bench,

Major HARDMAN, after a short consultation, said: We are satisfied that the Gas Company are bound to supply the gas; therefore we shall make the order, and fine them £10 and costs.

Mr. JORDAN applied for a special case for the Court of Queen's Bench, because there was no authority for the Bench to make an order.

The application was assented to.

* We are only waiting for the drawings promised by Mr. Cheyne to illustrate this paper, before we publish it in the JOURNAL.—ED. J. G. L.

BRADFORD (WEST RIDING) POLICE COURT.—THURSDAY, OCT. 23.

(*Before Colonel* POLLARD, *Mr.* H. W. RIPLEY, M.P., *Alderman* LAW, *Major* MIDDELTON, *and Mr.* W. ANDERTON.)

ILLEGAL USE OF GAS.

Samuel Johnson, farmer, of Pudsey, was summoned by the Pudsey Gas Company for unlawfully connecting gas-pipes.

Mr. FOULDS, who appeared for the Company, stated that on the 7th of July the defendant's farm was visited by an Inspector, who found that a pipe was connected with the main and carried into the house without communicating with the meter. The gas was not then burning, but on two or three subsequent occasions it was lighted. The defendant was spoken to on the matter, on the 27th of July, and he then admitted that he had used the gas, and that the connection was made last winter. From information which the Company had received, they were of opinion that the connection had, however, existed two or three years.

The *Defendant* pleaded guilty. He said that a man whom he had employed had made the connection last winter, and he (defendant) did not find it out until about two months afterwards. It was entirely owing to his own neglect that the connection had continued, as he had intended taking it off.

The CHAIRMAN said that the Bench did not consider that the defendant had been careless, but that he had attempted to defraud the Company. It was the worst description of stealing, because it was done in a nasty and sneaking way. The defendant would be fined £5 and costs; or, in default, two months imprisonment.

John Irlam, plumber, of Shipley, was summoned by the Airedale Gas Company for a like offence; and *William Robinson*, plumber, of Shipley, was summoned for improperly using gas.

Mr. TERRY appeared for the Company, and Mr. C. L. ATKINSON for the defendants.

The defendants, who are in the employ of Messrs. Rushworth and Son, plumbers, of Shipley, were working on the 15th of September at the Great Northern Hotel, Thackley, which was then in course of erection. On that date Mr. Senior, the Gas Manager, went to the place, and found a lead pipe had been connected with the gas-pipe, for the purpose of obtaining a light to melt solder. When Messrs. Rushworth and Son became acquainted with the matter, they wrote to the Company, stating that the connection had been made without their knowledge or consent.

For the defence it was stated that the Gas Manager had told the defendants that he had not a meter in stock which would be large enough for the building, and he had given them permission to make the connection. Mr. Senior, however, denied that he had given any authority whatever to the defendants to connect the pipes.

The CHAIRMAN said the majority of the Magistrates were of opinion that no permission had been given to the men to make the connection. The defendants would therefore each be fined 5s. and costs, as a warning to others.

LOCAL GOVERNMENT BOARD INQUIRY AT LINCOLN.—On Wednesday, the 22nd inst., Mr. Arnold Taylor, one of the Local Government Board Inspectors, held an inquiry at Lincoln with respect to an application to the Local Government Board by the Lincoln Urban Sanitary Authority for a Provisional Order to amend the Lincoln Water-Works Act, 1871, so as to increase their borrowing powers under the Act; also for permission to borrow, under the Public Health Act, 1875, £50,000 for works of sewerage, and £20,000 for street improvements. The application for the Order was considered first, and it was explained to the Inspector that the borrowing powers under the Act were limited to £85,000; but in consequence of the extension of the city, the whole of that sum had been expended, and about £5000 in addition. The Council therefore desired to ask power to borrow a further sum of £50,000; and though the amount asked for was considerably more than would be required for some time to come, they thought they would apply for a sum sufficiently large to last them for a number of years. The object of the application for the £50,000 for sewerage purposes was to obtain funds for carrying on works already in hand, and for others which were not included in the first estimates. The sewerage scheme was of a very comprehensive character, allowing for a considerable increase in the population, and was being carried out, under the direction of Mr. Mansergh, at an estimated cost of £133,500. Towards this amount the Council had already obtained sanction to borrow £84,000, and the £50,000 now asked for would suffice for completing the work, inclusive of the purchase of the necessary land.

ACCIDENT FROM AN ESCAPE OF GAS AT WORKSOP.—The *Nottingham Guardian* of Saturday last reports that on Wednesday morning a maiden lady, named Rebecca Keeling, living at Worksop, was discovered on the floor of her house in a state of unconsciousness, arising from inhaling gas which was escaping in her house. On Tuesday night the landlord of a hotel next door complained to the Manager of the Gas Company that there was a bad escape of gas in his pantry. Mr. Bates, the Manager, sent word to turn off the gas, use candles, and that it should be attended to next day. In the morning, Mr. Bates examined the premises, but could find no escape, nor was there any smell. At six o'clock in the evening Mr. Bates again visited the house, but there was no perceptible smell of gas. At seven o'clock, after the usual pressure had been put on the mains, Mr. Bates once more visited the house, and found the smell very bad. At length it became certain the escape was next door, at Miss Keeling's, and inquiry showed that nothing had been seen or heard of her since the previous evening. The back door of her house was burst open, and Mr. Bates was met by a large volume of gas. Ordering all lights to be kept at a distance, he groped his way upstairs, and searched till he found Miss Keeling's bed. Finding it empty, he came downstairs, and on entering the front room fell over her body. In this room Mr. Bates could hear the gas escaping loudly, and knowing the exact spot where the service-pipe from the main entered the house, he succeeded in crushing the leaden pipe, and so stopped the escape. He then undid the front door, and, help being at hand, Miss Keeling was taken out of the house and carried into the hotel, where medical aid having been obtained, everything was done to restore animation. The house was then locked up for the night. On visiting it next morning, Mr. Bates found that the gas pendant had been torn from the service-pipe at the ceiling. Judging from the position in which Miss Keeling was found, it is supposed that when putting out the gas, before retiring to rest on the previous night, she was taken with a fit, and in her fall clutched the gas pendant, tearing it down as she fell. Here she must have lain in the suffocating atmosphere for nearly twenty-four hours, and it is probably due to the fact that she lay in the draught between two doors that she was not suffocated. During the whole of Wednesday night she remained insensible, and continued in the same condition the greater part of Thursday. From a later account we learn that Miss Keeling is still in a precarious condition.

Miscellaneous News.

METROPOLIS GAS SUPPLY.

The following are Dr. Whitmore's reports on the illuminating power, pressure, and quality of the gas as supplied by The Gaslight and Coke Company in the parish of Marylebone during August and September:—

August.	Illuminating Power in Sperm Candles.			Mean Pressure in Tenths of an Inch.		Mean Quanty. of Sulphur in 100 Cu. Ft.	Mean Quanty. of Ammon. in 100 Cu. Ft.	Sulphuretted Hydrogn.
	*Mean of 22 Obser.	Highest.	Lowest.	Highest.	Lowest.	Grains.	Grains.	
Common gas . . .	16·80	17·71	15·90	31·68	15·25	12·13	0·16	No trace
Cannel gas	20·81	22·30	19·74	25·11	13·02	13·63	0·36	No trace

Mean of daily readings of barometer . . . 29·58
" " " thermometer . . . 71·35

September.	*Mean of 9 Obser.							
Common gas . . .	17·35	17·80	17·11	34·37	15·85	11·73	0·45	No trace
Cannel gas	21·67	22·41	21·00	26·02	13·35	12·25	0 35	No trace

Mean of daily readings of barometer . . . 29·87
" " " thermometer . . . 62·43

* Each observation consists of ten readings of the photometer, at intervals of one minute.

During the months of August and September, the mean illuminating power of the common gas consumed in the parish was equal to the light of rather over 17 candles; it ranged between 17·80 and 15·90 candles. Seventeen times it exceeded 17 candles, and on one occasion only did it fall, to the amount of the tenth of a candle, below the standard. The mean quantity of sulphur in 100 cubic feet of this gas was less than 12 grains, and of ammonia less than the third of a grain. During the same period the cannel gas gave a mean illuminating power exceeding 21 candles; it ranged between 22·41 and 19·74 candles. This gas was only once slightly below the standard. The mean quantity of sulphur found was less than 13 grains, and of ammonia about the third of a grain. On all occasions the pressure was good, and no trace of sulphuretted hydrogen was detected in either of the gases by the ordinary tests.

METROPOLIS WATER SUPPLY.

The following are Dr. Whitmore's reports on the composition of the water supplied to Marylebone during August and September:—

August.	In Grains, per Gallon.							In Parts, per Million.		In Degrees.	
	Total Solid Matter.	Loss by Incineration.*	Chlorine.	Equal to Chloride of Sodium	Nitrogen as Nitrates and Nitrites.	Oxygen required for Oxidizable Matter.	Estimated Organic Matter.	Free Ammonia.	Albumenoid Ammonia.	Hardness.	Hardness after Boiling Fifteen Minutes.
West Middlesex	19·40	0·90	1·04	1·71	·066	·042	·336	·00	·08	13·3	4·1
Grand Junction	20·20	0·98	1·10	1·81	·070	·044	·352	·00	·09	14·1	4·3
River Thames at Hampton .	22·40	1·06	1·20	1·97	·115	·076	·608	·01	·22	15·2	4·6

Temperature of West Middlesex water as drawn from the main. . 60° Fahr.
Temperature of Grand Junction water as drawn from the main. . 63° Fahr.
Temperature of Thames water as taken from the river at Hampton 62° Fahr.

September.											
West Middlesex	20·40	0·88	1·02	1·68	·072	·039	·312	·00	·08	14·2	4·3
Grand Junction	21·40	0·93	1·10	1·81	·070	·036	·288	·00	·07	14·8	4·3
River Thames at Hampton .	23·04	1·24	1·18	1·94	·106	·052	·416	·01	·14	16·1	5·2

Temperature of West Middlesex water as drawn from the main . 58·5° Fahr.
Temperature of Grand Junction water as drawn from the main . 59·5° Fahr.
Temperature of Thames water as taken from the river at Hampton 59·0° Fahr.

* The loss by incineration represents the amount of organic and other volatile matters contained in the imperial gallon (70,000 grains) of water. The total solid matter, *minus* such loss, consisted chiefly of carbonate of lime, with small quantities of other equally harmless salts.

The water of both Companies, as drawn from the mains, was clear and bright; that taken from the river was slightly turbid.

THE NEW GAS-WORKS AT BRISTOL.

The Bristol United Gas Company commenced to make gas at their new works at Stapleton on Tuesday last, being a fortnight earlier than the period originally contemplated. These works, it may again be mentioned, have been carried out by Messrs. John Aird and Sons, of Lambeth, and in the short space of nine months. In January last the whole of the ground was a series of fields; now it is covered in all directions with buildings, machinery, roads, and railway sidings. The gasholder-tank is 162½ feet in diameter, and 32 feet deep, and the holder is capable of containing 1¼ million cubic feet of gas. The retort-house, which is 225 feet by 70 feet, will also enable the Company to manufacture gas at the rate of 1¼ million cubic feet per diem.

The works have been carried out from the designs of Mr. Walter Fiddes, the Engineer to the Company—his son, Mr. William Fiddes, having acted as Resident Engineer. They are already connected, by means of the new siding, to the Great Western Railway, and will, later on, doubtless have a branch also to the Midland Railway, so as to ensure the delivery of coals always as required, and at the lowest possible cost.

The enormous increase in the demand for gas by this important city was especially felt in the winter of last year, being at the rate of 20 per cent. in excess of the consumption during the corresponding period of the previous year.

It is gratifying to know that, when urgent necessities arise, works of this description and magnitude can be accomplished in so complete and satisfactory a manner, and in so short a time.

NEWBURY CORPORATION GAS-WORKS.

At a recent meeting of the Newbury Town Council, it was resolved to request Mr. George Bower, of St. Neots, to examine and report upon the works and also the plans for the alterations and extensions prepared by Mr. J. G. O'Farrell, the Manager.

In his report, Mr. Bower states that he examined the works on Friday and Saturday, the 10th and 11th inst., and found the present manufacturing station "cabined, cribbed, confined." As the Council are by their Act precluded from obtaining, in the immediate vicinity of the works, any more land upon which to make the requisite extensions that are imperatively required, Mr. Bower considers that to expend more than is absolutely necessary upon the works, for temporary purposes only, would be throwing money away. The report then proceeds:

I consider that from the moment a gas-works gets into the hands of the local authority, who are not masters but servants of the public, it is their bounden duty to supply such a necessary of life as artificial light, at the least possible charge consistently with meeting the obligations they are under for the repayment of principal and interest. £3000 or £4000 might be expended on the existing works, which would probably tide you over the next three or four years; but the consumption of gas would overtake the extra provision made, and the capital so expended would be inevitably lost. In addition, however, to what would happen, gas could not be made at the least cost, and the inhabitants would have to pay more than they ought, as compared with works constructed so as to produce gas as economically as possible. No manufacturer can produce an article cheaply who has to resort to expedients which involve extra labour and expense in its production.

The heaviest daily consumption of gas is, at present, close upon 90,000 cubic feet, and the capacity of your gasholder is only half that quantity, while the least amount of storeage you should have is two-thirds, or 60,000 cubic feet; but it is considered to be only perfectly safe when the capacity of the holders is close upon the heaviest daily consumption. With a deficiency of storeage, more retorts have to be kept in action, many of which have to remain idle during daylight, through there being no gasholder room in which to deliver the gas; and they can only be put into work when it is time to light up, which lays undue stress upon the apparatus generally, and is highly injurious in every way. So much so is this the case now with you, that it will be impossible for your Manager to give you good gas at all times during the coming winter, and I shall wonder if he can keep you sufficiently supplied.

Mr. Bower considers that the land the Town Council have purchased near the railway to be an excellent site. Water, however, being within a few feet of the surface, the gasholder-tanks will have to be of iron, and principally above the ground level. He strongly advises the erection of new works, but recommends that the gasholders at the old works should be left where they are, until either worn out, or the ground upon which they stand becomes so valuable as to render it advisable to remove them, in which case they could be re-erected at the new works; some portions of the machinery at the old works could also be removed to the new ones.

Mr. O'Farrell's plans, which the report states "do him credit, and are on the whole very satisfactory," are designed for the manufacture of from 25 to 30 million cubic feet of gas a year, which is about double the present production. When that quantity is required, the works now planned will only have to be added to, not done away with, to still further increase the production. Provision is made for this by arranging the retort-house so that it can be extended, the purifying-house so that additional purifiers can be provided, and room is left for more gasholders; "but," adds Mr. Bower, "while it is well to look forward, it is *not* well to think too much of the requirements of posterity."

The expenditure on the old works was £12,500. Mr. O'Farrell's estimate of the cost of the new works is £10,000, to which Mr. Bower makes certain additions, amounting to £1500; the total being raised to £25,000 by the provision of a 12-inch main from the new works to that already laid of the same diameter, and the setting of the mains and services throughout the town in an efficient state. This capital will be only about £2 per head of the population by the time the works are completed.

Mr. Bower then applies himself to the question of the charge necessary to be made for gas in the event of the new works being undertaken. On this point he says:

I understand that you have 50 years in which to repay the principal, and as you can borrow this, on the security of the works and rates, at 4½ per cent., the amount required to pay each £100 of principal and interest combined, by equal yearly instalments, would be £4 17s. 1½d., or £1214 1s. 3d. per year during the whole 50 years, and this yearly sum would extinguish the debt and interest at the end of that period. This, I consider, the proper way to deal with both the present and the future generation, distributing the amount equally between them. If interest be paid upon the balance by the present ratepayers, the next generation of them will be let off very easily. But I question if the living ratepayers feel for those still to be born sufficiently to let them off the duty of paying for property the fair share of which their fathers before them had also to pay. Supposing, however, that £1490 a year will have to be provided for, in addition to the sum received for rent of the buildings and site of the old works, then the question will be asked, At what price can gas be sold from the new works so as to produce this profit? My answer is as follows:—The works will be capable of supplying from 25 to 30 million cubic feet of gas per annum. Your present consumption is about 13 millions; and directly the new works are finished you can supply gas at 5*s.* per 1000 cubic feet. When the consumption gets up to 20 million cubic feet (as it speedily will), you can then supply at 4*s.* 2*d.* per 1000 cubic feet.

The report concludes with a well-merited reference to Mr. O'Farrell's great exertions in the preparation of the plans and estimates: "It is but seldom that a manager is met with in a small town like Newbury who can prepare plans;" and "whoever may carry out the works, I consider Mr. O'Farrell thoroughly qualified to see that they are done properly."

A Special Meeting of the Newbury Town Council was held last Wednesday to consider the above-named report. The minutes of the meeting of the Gas Committee held on the previous day were read, and it appeared therefrom that it was proposed that Mr. O'Farrell's plans and specifications be again submitted to Mr. Bower for his amendment, as suggested in his report, and this having been done, that tenders be advertised for, for the erection of the whole works in one sum, and for the different sections in separate sums, and that the cost of the gasholder be given separately; and this, on being put, was carried by the casting vote of the Chairman. A motion for the adoption of the minutes having been made, a long and desultory discussion ensued on the general policy of the enlargement of the works. It was at length agreed—"That Mr. Silverthorne, of Westminster Chambers, London, be allowed to inspect the Newbury Gas-Works, with the view of ascertaining whether a sufficient quantity of gas—say 20 to 30 million feet per annum—can be manufactured on the present site, exclusive of that part at present occupied by the gasholders, by suitable alterations and improvements, and at what cost, before any proceedings be taken;" and—"That the report of the Gas Committee, as far as that the plans be referred to Mr. Bower, be adopted, and that in the meantime the Town Clerk apply to the Great Western Railway for information as to a siding or other means of connection or communication with the works."

EXTENSION AT THE SYDNEY (N.S.W.) GAS-WORKS.—We learn, from *Engineering*, that the Sydney Gaslight Company have just completed a large gasholder in the vicinity of the Haymarket. The works in connection with it have been nearly three years in hand, and have involved an expenditure of something like £33,000, the tank costing about £22,000, and the holder £11,000. The plans were designed by the late Engineer of the Company, Mr. Stephen, who superintended the works during his connection with the Company; and since then they have been carried on under the direction of the present Engineer, Mr. T. J. Bush. The gasholder tank, built of solid masonry, is 105 ft. 6 in. diameter, and 36 feet deep. The outer holder is 103 ft. 6 in. by 36 feet. The tank contains 1,500,000 gallons of water, and the holder, when filled, will contain 580,000 cubic feet of gas. That this new holder was needed is proved by the increasing demand made upon the works, where at present about a million feet of gas are manufactured daily.

SURREY CONSUMERS GAS COMPANY.

The Half-Yearly General Meeting of this Company was held at the Terminus Hotel, London Bridge, on Friday last—BENJAMIN DUVALL, Esq., in the chair.

The SECRETARY (Mr. W. P. Boddy) read the notice convening the meeting, and the following report and accounts were presented:—

The accounts and balance-sheet for the six months ended the 30th of June, duly audited, are hereto annexed.

The revenue account shows a profit on the half year's working of £22,914 14s. 1d which, after deducting the interest on debenture capital, leaves a net profit of £21,456 9 available for dividend, out of which the Directors recommend the usual payment 5 per cent. for the half year.

The amalgamation between the South Metropolitan Gas Company and this Compan has been approved by the Board of Trade, and only awaits confirmation by the Order i Council. The terms finally settled are even more favourable to the Shareholders of th Company than were previously sanctioned at the special meeting of the Company on th 27th of May last.

1.—REVENUE ACCOUNT, *for the Half Year ended June 30, 1879.*

Dr.			Cr.		
To Manufacture of gas—			**By Sale of gas—**		
Coals, including dues, carriage, unloading, and trimming	£22,005 13 0		Common gas, per meter, at 3s. 9d. per 1000 cubic feet	£42,809 17 4	
Gas	368 7 6		Public lighting and under contracts	7,568 13 10	
Salaries of Engineers, Superintendents, and other Officers at Works	930 0 0				£50,378 11
Wages (carbonizing)	5,014 9 5		**Residual products—**		
Purification, including labour	1,826 2 1		Coke, less labour and cartage	£8,562 4 7	
Repairs and maintenance of works and plant, materials, and labour	3,328 13 8		Breeze	206 0 0	
	£33,473 5 8		Tar	1,734 19 5	
Less old materials sold	12 0 0		Liquor	2,829 12 10	
		£33,461 5 8			13,332 16
Distribution of gas—			**Rents receivable**		70 5
Salaries and wages of Officers (including Rental Clerks)	£179 0 0		**Transfer fees**		9 0
Repairs, maintenance, and renewal of mains and of service-pipes, including labour	1,200 2 7		**Rental of meters**		1,074 14
Repairs and renewals of meters	441 11 0				
		1,820 13 7			
Public lamps—					
Lighting and repairing		755 11 9			
Rents, rates, and taxes—					
Rents payable	£124 13 10				
Rates and taxes	1,836 13 8				
		1,961 7 6			
Management—					
Directors allowances	£1,000 0 0				
Company's Auditors	52 10 0				
Salaries of Secretary, Accountant, and Clerks	675 9 0				
Collectors commission	635 6 1				
Stationery and printing	164 2 9				
General charges	881 5 2				
		3,408 13 0			
Law charges		10 10 0			
Bad debts		206 15 8			
Discount allowances		310 17 3			
Public testing-stations		15 0 0			
Total expenditure		£41,950 14 5			
Balance carried to profit and loss account, No. 3		22,914 14 1			
		£64,865 8 6	**Total receipts**		£64,865 8

2.—CAPITAL ACCOUNT.

	Expenditure to Dec. 31, 1878.	Expended this Half Year.	Total to June 30, 1879.		Certified Receipts.	Received during Half Year.	Total Receip to June 30, 18
To Expenditure	£289,521 13 5	..	£289,521 13 5	**By Ordinary shares of £10 each**	£230,000 0 0	£19,530 0 0	£249,530 0
Balance			20,008 6 7	**Mortgages and bonds**			60,000 0
			£309,530 0 0				£309,530 0

3.—PROFIT AND LOSS ACCOUNT.

Interest on mortgages and bonds to June 30, 1879	£1,458 5 1	**Balance from last account**	£27,496 2 0
Balance applicable to dividend on ordinary share capital	22,692 2 8	**Less dividend on ordinary capital for the half year ending Dec. 31, 1878**	£11,260 8 4
		Amount carried to reserve-fund to June 30, 1879	15,000 0 0
			£26,260 8 4
			£1,235 13 8
		Amount from revenue account, No. 1	22,914 14 1
	£24,150 7 9		£24,150 7 9

4.—RESERVE-FUND.

Balance, June 30, 1879	£25,306 14 8	**Balance, Dec. 31, 1878**	£10,153 7
		Interest, Jan. 22, 1879	153 7
		£15,444 0s. 4d. Consolidated Three per cent. Annuities, June 24, 1879	15,000 0
	£25,306 14 8		£25,306 14

5.—DEPRECIATION-FUND.

Balance, June 30, 1879	£6,000 0 0	**Balance, Dec. 31, 1878**	£6,000 0
	£6,000 0 0		£6,000 0

6.—GENERAL BALANCE-SHEET.

To Capital—		**By Cash at Bankers**	£31,686 4
For balance, per account No. 2	£20,008 6 7	Ditto on deposit	5,000 0
Net revenue—		Cash in office	156 17
For balance, per account No. 3	22,692 2 8	Reserve-fund	25,306 14
Reserve-fund—		Coals, for stock on hand	1,419 7
For balance, per account No. 4	25,306 14 8	**Gas-rental—**	
Depreciation-fund—		Balance of this account due to the Company on June 30, 1879, less deposits and prepayments	19,654 15
For balance, per account No. 5	6,000 0 0	**Coke and other residuals**	2,128 10
Debenture interest for amount due to June 30, 1879	1,458 5 1	**Sundry accounts**	33 15
Unclaimed dividends	76 14 2		
Sundry tradesmen and others, for amount due for coals, stores, and sundries	9,814 2 0		
	£85,386 5 2		£85,386 5

The CHAIRMAN said: I will move—"That the Directors report be received, adopted, and entered on the minutes." I certainly did anticipate on the last occasion that that would be our last meeting, and it has been through no cause either of the Surrey Consumers Company or the South Metropolitan Company that the terms of amalgamation were not completed before this. We have each of us done our duty to bring it on as fast as we could, but, as you are aware, we were in the hands of the Board of Trade, and they will take their time. But for the last five or six weeks I may say that it has almost passed out of the hands of the Board of Trade and gone into the hands of the Privy Council, with whom it now is. We should have called our meeting somewhat earlier, but on that account—the thing not being settled—we drove the meeting off so long, and I hope you will not attach any blame to us for it not being called at the usual time. I am, however, happy to tell you that the subject of the amalgamation is before the Privy Council, and I believe—in fact, we had information of it from the Board of Trade last night—that a Council meeting will be held on the 28th of this month—next Tuesday—and I have no doubt that the amalgamation will be finally settled then. As to why it has been delayed so long, you know that there was a scheme proposed at our last meeting, but that scheme was not fully carried out, because it could not be. We had entered into a scheme that we should participat up to 11 per cent., and no further. Then the Secretary of the Board o Trade said: "That will not do; the B Shareholders will become p sessed of more power than the A's, and will have no inducement to low the price of gas, unless they are under the sliding scale, and therefo they ought to be under the sliding scale." Well, as far as that went, w are only now going to participate up to 10½ per cent. instead of 11; bu though we shall progress slowly, we shall get up to 11 per cent., becaus for every penny reduction in the price of gas we get 2s. 6d. per cen so that is one-eighth. And I do not know that there is any trade so pr gressive as gas. The South Metropolitan tell you that they have gaine something like 14 per cent.

Mr. G. LIVESEY: An increase of 14 per cent.

The CHAIRMAN: Yes; I do not know what our increase has been, bu something more, and we are going on increasing. You see our balanc sheet, which is one of the best we have ever presented; for our dividend will take £11,500 out of the £21,500 which is available, and we have therefore £10,000 to the good. Now, that being a very satisfactory state of things, you may say, "Why did you amalgamate?" For the very reason that I have told you in times past—that we could not go on much further. Our

trade increased so rapidly, and our works did not, and that is why we could not go on. I have no doubt that the South Metropolitan also saw their position, for, crossing the water the other day, I noticed the river was blocked up. They had had to get fresh works, and we should have had to get fresh works; and the consequence is that the amalgamation is good for all parties. Instead of our stopping at 11 per cent., as I told you before, if we reduce the price of gas, for every 1d. we get 2s. 6d. per cent., so that if we reduce the price to 2s. 6d. per 1000 feet we should have 11¼ per cent. Now let us look at the state of our works. I have been with you for over 30 years, and I know that we were once in the greatest difficulties, and could not pay any dividend. My name stood at the bank for £12,000, and so bad was our position that our Secretary would not take his salary. I have been at the bank when they have said, "What do you want? If you want a couple of thousand, we will let you have it;" but Mr. Pocock and I had to be responsible for it. We have stood by you all through this, and have brought the Company to its present position. At that time gas throughout London, with one exception—the Great Central Company—was charged at the rate of 6s. per 1000 feet; but we have worked the concern to its present position of paying you 10 per cent., and reduced the price of gas to 3s. I think, therefore, that we have brought it to a very good state indeed, and I hope that you are all satisfied, as I am. I have nothing more to say, except that I have no doubt that the amalgamation will be settled on the 28th of the month. As to the terms, one gentleman said that the Directors had no doubt taken good care of themselves, but that they had not thought of the Auditors. Well, we went up to see Mr. Farrer respecting the Auditors, and he said the Board of Trade would not move—they thought two years remuneration was sufficient. They have cut us down by one-half; but we submitted to all that, knowing that it was beneficial both to the shareholders and the consumers.

Dr. LIDDLE seconded the motion, and it was carried unanimously.

The CHAIRMAN then moved the declaration of a dividend of 5 per cent. for the half year, less income-tax.

Mr. NICHOLSON seconded the motion. That, he said, was the last time they would receive such a dividend as 5 per cent., as the next would be 5½, because they were now, anticipating the decision of the Privy Council, charging 3s. per 1000 feet in their district. That charge entitled them to receive, after the amalgamation scheme was passed, and the confirmation of the scheme was completed, a dividend of 11 per cent. The charge of 3s. per 1000 feet came into effect in their district on the 1st of July, and, as he had said, it entitled them to receive a dividend at the rate of 11 per cent. Therefore he said with certainty, that they would receive next time a dividend of 5½ per cent. for the half year. They would receive it from the South Metropolitan Company, the Surrey being then merged in it in the same name. The Surrey shares would be called in in due time, and would be exchanged for South Metropolitan shares. The scheme which the Board submitted to the Shareholders on the last occasion they sanctioned provisionally, giving the Board the power to modify the terms, and they had modified them, and had done so in the Company's favour. They were bound by the original terms to 11 per cent. and no more; it was to stop there. Now it did not, and it would range up to 11¾ or 12 per cent. When the price of gas was 3s. they would receive 11 per cent., when the price was reduced to 2s. 10d. they would receive 11¼ per cent., when it was reduced to 2s. 8d. they would receive 11½ per cent., and when it was reduced to 2s. 6d. they would receive 11¾ per cent., and he was sanguine enough to believe that the time was not very far distant when they would certainly receive 11½ per cent. He thought, therefore, under these circumstance, that the Shareholders had every right to congratulate themselves upon it, and the Board had as much right to be satisfied, as the Shareholders representatives, with the success of the negotiations respecting the amalgamation. He thought that all the Shareholders would consider themselves well placed. Leaving the subject of dividend, what effect had it had on their property—their capital? Before there was any notion of amalgamation with the South Metropolitan, the Surrey Company's shares stood at 17—that was 170—and they now stood at 195. They could not buy the stock of the Company that morning, for he had been to ask the question, at 195. They knew that the Chartered Company's shares were 180, and therefore this Company stood 15 per cent. above the Chartered in the estimation of the public, measured by the price of the shares. He therefore thought that on every hand, on every account, they had a right to congratulate themselves.

The motion was put, and carried unanimously.

Mr. N. J. POWELL then proposed a vote of thanks to the Chairman and Directors. They had had for many years some very profitable meetings, but it appeared to him that the present one was the most profitable that the Shareholders had been permitted to attend. He was satisfied, from his long experience of the Company, that the Directors had done the very best they could for the general interests of the Shareholders, and they had to thank their friends, the Directors, for the happy result at which they had arrived that day. He was quite satisfied that they had not been selfish in the matter, but that they had sought the general welfare of the Shareholders, and he was sure that it had terminated well for them. They might not receive 11½ or 11¾ per cent. for several years, and perhaps some among them would never have such a dividend; but it might come in the course of time, and their descendants might receive it. He was satisfied that the Board of Trade, as well as the Directors, had looked sharply after their interests, and he had no doubt that the amalgamation would be a good thing for the Shareholders of this Company and likewise for those of the South Metropolitan Company. They had to thank the Directors and to congratulate themselves, and he was sure that the resolution he proposed—"That the best thanks of the Shareholders be given to the Directors"—would be carried unanimously.

Mr. W. SMITH, in seconding the motion, said that they could not have met under more auspicious circumstances than they did. He had been connected with the Company for over 30 years, and had always been highly satisfied with the management. The Directors had attended to everything worth looking after in the Company; they had tided the Company through very great trials and difficulties; but they had weathered the storm, and were met that day in better circumstances than ever.

The CHAIRMAN: Before the motion is put, there is one thing I omitted. You will remember that on the last occasion I had to report to you the death of our old and esteemed friend, Mr. Laughton, who was so many years with us. I have now to report to you, though perhaps most of you have seen it, that our lamented late Chairman, Mr. Thomas Pocock, who was respected by all who knew him, is dead. He had arrived at the age of 89 years. He had been with me from the starting of the Company. We all regret his loss; but having arrived at that time of life, it was not unexpected.

Mr. Powell then put the motion, and it was carried unanimously.

The CHAIRMAN, in acknowledging the vote, said: Mr. Powell, I thank you very kindly for myself and co-Directors. Your words are kind and expressive, and I know you spoke with sincerity. We appreciate that sort of thing, and we thank you for the vote and the very handsome manner in which you have proposed it. There is one more acknowledgment I have to make, and that is with reference to the labours of our Engineer and Secretary. Their duties have been arduous. They are faithful servants, and whatever you did for them you could not do too much. Mr. Boddy and Mr. Finlay are both true friends of the Company. I do not think any Company could have a better engineer than ours. I am speaking in very broad terms when I see the Engineer of the South Metropolitan Company here, but I am speaking of ourselves. Without their aid and assistance you would never have been brought to the position you have attained. I therefore beg leave to propose a vote of thanks to them for their ingenuity and very great kindness. I must also tell you that we have that confidence in our Engineer, that we have proposed to-day that he shall represent us on the Board of the South Metropolitan Company. We thought of sending three of our Directors to that Company's Board; but the Board of Trade will not agree to it. They will not allow us to send more than one—at least, there are six Directors there, and the Board of Trade will only allow seven. Each of us has given up in favour of Mr. Finlay, and we have placed him on our direction on purpose that we should appoint him a Director of the South Metropolitan Company. We have done that to-day, and he is our representative, and we regard him also as yours, knowing that he will look well after your property.

Mr. STEPHENSON CLARKE, in seconding the motion, said that had it not been for Mr. Finlay, they would never have been in such a prosperous state as they were. It was all very well to thank Directors, but without good captains they would have been badly off. With regard to Mr. Boddy, there was not a better Secretary in London.

Mr. POWELL said he had had much to do with their friend, Mr. Boddy. He (Mr. Powell) had now been an Auditor for more than 20 years, and he thought it would be some satisfaction to the Shareholders generally that one who had been so intimately connected with their accounts should be able to testify that, without exception, the Auditors had never found an error in the statement presented to them every half year. Mr. Boddy had been one of the most accurate and painstaking Secretaries he had ever known. He had used extreme perspicuity in all the accounts, and the Shareholders had reason to be thankful that they were brought through so well as they were that day. Of Mr. Finlay he had a high opinion, though he had not had the same practical experience of that gentleman's ability; but, after what they had heard from the Directors, and knew of the working of the Company, they ought all to join in the vote.

The resolution was carried unanimously.

Mr. FINLAY said that perhaps a few words were due from him on that occasion, and he was quite sure that the Directors would not feel the least annoyed at anything he was about to say; but having been engaged in working out the amalgamation under the Board of Directors, of course he had been intimately acquainted with all the facts and figures, and everything connected with it. He thought it might be interesting to those present to know the exact position of the Company in the future, and he would endeavour briefly to show them their position as regarded dividend. Both Companies shared equally up to 10½ per cent., and after that the proportion of dividend, at a 3s. 3d. price, payable to the A stock, which would mean the South Metropolitan stock, would be £10 16s. 3d., and to the B capital—the Surrey stock—£10 12s. 6d.; at the price of 3s. 2d. it would be to the A stock £11 2s. 6d., and to the B stock £10 15s.; at 3s. 1d. it would be £11 8s. to the South Metropolitan stock, and £10 17s. 6d. to the Surrey; at 3s. it would be £11 15s. to the South Metropolitan, and £11 to the Surrey. At that stage he might perhaps pause to say that the South Metropolitan price to this Company would be 3s. 2d., but they had reduced it to 3s., so that the Surrey shareholders might receive next half year a dividend at the rate of 11 per cent. At 2s. 11d. the South Metropolitan would receive £12 1s. 3d., and the Surrey £11 2s. 6d.; at 2s. 10d. the South Metropolitan would have £12 7s. 6d., and the Surrey £11 5s.; at 2s. 9d. the South Metropolitan would have £12 13s. 9d., and the Surrey £11 7s. 6d.; at 2s. 8d. the South Metropolitan would receive 13 per cent., and the Surrey £11 10s.; at 2s. 7d. the South Metropolitan would receive £13 6s. 3d., and the Surrey £11 12s. 6d.; and at 2s. 6d. the South Metropolitan would receive £13 12s. 6d., and the Surrey £11 15s. He thought he might say a few words on the position taken up by the Board of Trade. He thought that they were quite right, and that they had acted clearly in the interests of the consumers; but the South Metropolitan Directors and Officials and the Directors and Officials of the Surrey Company thought that they had fully and thoroughly considered the scheme, and no doubt they had given a great deal of attention to it. When, however, the scheme was sent up to the Board of Trade, there were other minds brought to bear on it, and these were legal minds, and they saw legal objections to it, and there were objections in this respect—that according to the old scheme the Surrey shareholders were only to receive 11 per cent. After that they would have no interest in the working of the concern, and Mr. Farrer very properly objected to it. He insisted on all parties having an interest in the reduction of the price of gas. The opinion was asked of the Attorney and the Solicitor General as to the legality of the proposal, and then the South Metropolitan and the Surrey Directors arranged a scheme, so that the holders of both the A and B stocks should have an interest in a reduction of the price of gas; and, if they had followed the figures he had given them, they would see that the B Shareholders had quite as much interest in the working of the concern as the A's; and it was quite as much to the interest of the Surrey shareholders as to the proprietors of the South Metropolitan Company that the price of the gas should go down and the dividends rise. He would only say a few words more. After a service of nearly 19 years with this Company, and 10 years with the Commercial Gas Company, the Directors had that day elected him to a seat at the Board of the South Metropolitan Company, for which he need scarcely remind them that he felt very much indebted, and he also felt very much indebted to the shareholders of the Surrey Company for the many times he had met them and had been so favourably received. He hoped that he would still have the pleasure of meeting his old friends in connection with the South Metropolitan Company, and if things went on as pleasantly in the future as they had done in the past, he thought that no one would have cause to regret the change.

Mr. BODDY said that this was the last time he would have the privilege of appearing before them. In parting with them it was like parting with old friends, and he sincerely thanked them for the many acts of kindness which he had received from them at various times. He took this opportunity also of thanking the Directors for the confidence they had always placed in him. Perhaps he should not be accused of egotism if he said that he felt that this confidence had not been misplaced. He had done the best he could for the Company and for the Shareholders, thinking at all times less of his own interests than of those whom he represented.

The proceedings then terminated.

SALE OF SHARES IN THE WANDSWORTH AND PUTNEY GAS COMPANY.—At the Auction Mart, Tokenhouse Yard, London, on Wednesday last, Messrs. Fox and Bousfield offered for sale 16 fully paid-up original £10 shares in the above-named Company, entitled to a dividend of 10 per cent.; also 5 ordinary £10 7½ per cent. shares, and 23 similar shares bearing 7 per cent. dividend. The original shares were sold—8 at £19 5s., and 8 at £19 each. The other shares sold for £14 15s. each. The total amount realized by the sale was £719. The shares were sold with the half year's dividends due at Christmas next.

MIDLAND ASSOCIATION OF GAS MANAGERS.

The Eighth Quarterly Meeting of this Association was held at Birmingham on Saturday, the 18th inst. By the kind permission of the Gas Committee of the Corporation of Birmingham, their Windsor Street and Saltley works were thrown open for the inspection of the members, who devoted the morning to the visits, Mr. C. Hunt and Mr. H. Hack acting as their guides through the works. At the close of the inspection a vote of thanks to the Committee was heartily accorded.

In the afternoon, the ordinary meeting was held at the Midland Hotel —Mr. Charles Hunt, President, in the chair.

The minutes of the previous meeting having been read and confirmed, Mr. Parker, Oakengates; Mr. Smith, Sutton-in-Ashfield; and Mr. H. Woodall, Leeds, were elected Members of the Association.

Mr. J. Annan (Wolverhampton) was then called upon to introduce the subject of Condensation. He said his object would be to elicit from each member, as far as possible, the results of his own individual experience, rather than to lay down any definite formulæ. Much uncertainty existed with regard to this subject, although several rules had been worked out by gentlemen eminent in the profession, from which much good had resulted. Leaving the retorts at a temperature varying from 300° to 460° Fahr., the gas, after passing through the stand-pipe and bridge-pipe, altogether about 10 feet in length, should on entering the hydraulic main become reduced in temperature to about 113° Fahr., a higher degree of heat indicating inadequate capacity of hydraulic main. Where sufficient attention was not paid to efficient condensation at this stage, a formation of pitch was likely to be the result, with the consequent stopping up of the passage for the gas. In such matters as this no formulæ could supply the place of practical experience and careful watchfulness. Above all things it was absolutely necessary that every part of the condensing apparatus should be provided of ample capacity to meet not only the necessities of the hour, but also to meet those of an ever-increasing consumption. The varying climate of England likewise made it quite desirable that facilities should be afforded for bringing into use or throwing out of action any portion of the condensers as often as might be found necessary, and a system of valves, properly arranged, enabled this to be done. In some experiments he had lately made with an annular condenser, he found an area of surface of about 10 feet per 1000 cubic feet of gas made per 24 hours was sufficient for a reduction of temperature from 90° to 60° Fahr. After passing through the exhauster, the gas was found to have a temperature of 62°, and he then cooled it further by means of a battery condenser, bringing the temperature down to 52°. In this second condenser very little tar or liquor was deposited, the former being of a very fine quality and a good lubricant, while the gas was in no way deteriorated. He had found that different classes of coal required, for the gas made from them, varying degrees of condensation, in proportion, probably, as they contain more or less of aqueous vapour. He therefore felt that it was impossible to lay down any set of rules that could take the place of care and practical experience. In his opinion there was no advantage to be derived from the employment of thin material for condensers, although where water was used wrought iron would be found to be the best for the purpose. He concluded by directing the attention of the members to some drawings of different forms of condensers which he had prepared for inspection.

The President, in putting the matter before the meeting, invited discussion, not only on different forms of condensers, but chiefly upon the effect of the presence of tar upon the gas at different temperatures. The subject was engaging much attention at the present time, and, in addition to discussing it there, it might with advantage be investigated by the members at their different works.

Mr. Annan asked the opinion of the members as to carrying the tar through a long length of piping before entering the condenser. His own notion was that the sooner the heavy tar was taken away from the gas the better. At one time he carried the tar straight away, never allowing it to remain in the hydraulic main; but when the theory was started of carrying the tar and gas together, and so enriching the latter, he fell in with it. But he had been making experiments, and he thought he should be able to demonstrate by-and-by that, after all, it was better to take away the heavy tar than to leave it to go on with the gas, for the latter, he thought, could not take up anything from the heavy tar, but only from the light oils that floated on the surface.

Mr. C. E. Jones (Chesterfield) said they found, in the old literature of gas-making, condensers of all sorts and sizes—air condensers, surface condensers, annular condensers, and, in some cases, no condensers at all, the main being supposed to be of sufficient length to condense all the volatile products that it was thought fit to remove. He considered the vertical condenser the best, both with regard to compactness and effectiveness. He did not hold with the theory of condensation as at present advocated by certain men who were looked upon as great authorities—viz., that by allowing the gas to travel with the tar, the illuminating power of the former was improved. That, he thought, was a fallacy. He had devoted some consideration to the subject, and was still engaged in experimenting. He believed the best way to obtain good condensation was to reduce the gas down to a temperature of 60° Fahr. He did not say that a gradual reduction was not desirable, but not to such an extent as was often advocated by the apostles of the slow cooling theory. When they had cooled the gas down to 60° Fahr. in the condenser, then they were enabled to eliminate with greater facility the ammonia, the sulphuretted hydrogen, the carbonic acid, and the bisulphide of carbon. It was very true that good condensation was half purification; but, so far as his experience went, he still felt that condensation might be, and frequently was carried too far. On the other hand, in very many instances it was not carried far enough. In most condensers in medium-sized works there was no power of control over the flow of gas; and hence when they were making the most gas—viz., in winter—they had, in proportion to the hourly make, less effective surface for condensation than in summer, the result being excessive condensation in summer, and half condensation in winter. He agreed with Mr. Annan that the sooner the tar was taken away from the gas the better. He should not, however, take away the tar at the hydraulic main and allow the gas to travel by a separate medium, but preferred to allow both to travel together for a short distance.

Mr. R. O. Paterson (Cheltenham): For what reason?

Mr. Jones said one reason was that they could remove the tar easier. By allowing the hot gas to travel with it they had less liability to get thick tar in the pipes, because they had the warm gas to assist in keeping up its fluidity.

Mr. Paterson: That is a question of keeping tar thin, and not of condensing gas.

Mr. Jones, continuing, said there was undoubtedly a condensing operation going on at the same time. When they had allowed the gas and tar to travel together, the lighter oils with which the gas was supposed to be enriched were, to his mind, deposited again as fluids, and never reached the consumers burners. The chief point, however, in condensing was to get the temperature down to 60° Fahr., and then they had done as much as most people could with advantage do in ordinary working.

Mr. G. E. Stevenson (Peterborough) said he thought there could be little doubt that to permit the gas to pass away in contact with the tar from the hydraulic main did not add to the illuminating power of the gas. The chief thing in condensation was to regulate the speed of the process. Having once secured a sufficient area of condensation, and sufficient power of condensing the whole of the gas made, the thing was not to hurry the gas away from the hydraulic main at great speed. If it was hurried away it would not deposit the tar properly, but even if it left the condenser at 60°, there was a large quantity that would afterwards deposit. Another great point was this, that if the gas was gradually condensed, say to something like 80° or 90°—certainly considerably above 60°—and after that was passed through a powerful condenser, it mattered little to what degree of cold it was afterwards exposed. But if the gas was suddenly hurried from a temperature of 130° or 140° into a condenser which was exposed to the open air, and the gas was rapidly cooled to 60°, it was robbed of its illuminating power. If, however, the gas was very gradually cooled down to 80° or 90°, then there was no further appreciable reduction in illuminating power if the gas was exposed to a very low temperature afterwards. That, he thought, was the secret of condensation—that they should condense the gas slowly, and bring it down to something approaching the normal temperature of the atmosphere before taking it outside the walls—if possible, in the retort-house; but, at any rate, before exposing it to the outside temperature.

Mr. H. Woodall (Leeds) said they had learnt from this discussion how very lamentable was the lack of information on technical points. He thought the subject of condensation had never received the amount of attention it deserved. At one time they had one theory advanced, at another time another, and each was pursued to an extreme by the great bulk of managers when once it had obtained credence. Yet there was throughout an absence of experimental work. There was no doubt, however, that by the present system of slow condensation, where 14-candle gas was manufactured, the evil of naphthaline deposits had been materially abated; and it should not be forgotten that hitherto this had been, generally speaking, the sole object in view. But now there came up as a new proposition—although it was discussed some time ago—the evil that arose from carrying tar in contact with the gas. Personally he was disposed to think that there was an absolute loss of illuminating power due to this circumstance. It so happened that at one works only, out of the three under his control at Leeds, was the tar removed direct from the hydraulic main, and it was remarkable that at those works the standard quality of gas was maintained with a much smaller percentage of cannel than at either of the others. There was, however, a great variety in the coals used, and it would not do for him to jump to conclusions. Mr. R. H. Patterson, in his recent very interesting and valuable contribution to the Journal of Gas Lighting, had drawn attention to the experiments made by Mr. Young, which showed conclusively that there were tarry oils that would impoverish the gas, while there were others that would enrich it; and it appeared to him (Mr. Woodall) most reasonable, from the evidence before them, to anticipate the best results from a rapid withdrawal and condensation of the heavier tar, and a prolonged contact of the lighter. If he was right there was a ready agent at hand applicable to every form of condenser—viz., water; and he was then arranging a set of condensers for a series of experiments on a practical scale.

Mr. Paterson said Mr. Woodall's remarks on this question were in entire accordance with his own opinions. He thought it was not possible to too speedily remove what they called tar from the gas. But in order to fully understand this question they wanted a great deal more of experimental research. It was singular that they had learnt so little on this question in the last dozen years, because the Rev. Mr. Bowditch, who was a well-known authority on the question of condensation, had advised the adoption of this very system, and laid it down very explicitly in his book on "Coal Gas." There was the same expression of opinion there that Mr. Woodall had advanced. But he (Mr. Paterson) would be disposed to go farther than Mr. Bowditch. That gentleman recommended the withdrawal of the tar at a much lower temperature than his experience led him to believe was the right one. If they accepted Mr. Bowditch's reasoning it would lead them to this inference, that the hotter they could keep the gas, up to the time they attempted to separate it from the tar, the better it would be. He should be disposed, if he had the opportunity, to take a very rapid means of removing the tar. But he should not expect to do this to the best advantage in the ordinary process of condensation. He did not think Mr. Woodall's contemplated experiment would result in much benefit to him, believing that it would be better to apply direct to the end of the hydraulic main an extractor—such, for instance, as Pelouze and Audouin's—and there remove all that was of a tarry nature. Of course, this would be done at a higher temperature than could be obtained at any other part of the plant, and there would be less risk of removing some of the lighter hydrocarbons, because those condensed in the outlet end of the extractor would, in their downward progress, come in contact with the greatest heat they could apply at the end of the hydraulic main, and would thus be driven forward in the gas. He would like to begin with that point, as the first point of condensation after the gas had left the retort. There was, however, a great deal to be said as to the condensation taking place between the mouthpiece and the hydraulic main. He had repeatedly tested the temperature of the gas—speaking of it in the sense in which they had to apply the term—at the point which he had named, and he found that the temperature at the mouthpiece was extremely high—very much higher than Mr. Annan had stated—he thought more likely twice the temperature—viz., 600° or 700° Fahr., and that between this point and the hydraulic main there was a condensation taking place, from 300° or 400°; or, as he thought, from the higher figure he had named, to 140°. There was no saying what changes had taken place in the gas in the pipe in the course of that rapid cooling. They could hardly expect, however, to do much with it between the mouthpiece and the hydraulic main, but he would suggest the extraction of the tar directly the gas reached the latter. He should think that experience had proved that the passing of the gas through either a horizontal or a vertical condenser did not affect the amount of work done so much as it did the character of it. He thought that condensation in the horizontal condenser was, surface for surface, quite as great as in the vertical, but in the latter they had a vast deal more of the purification process going on, and, consequently, more beneficial work done. But the extraction of the lighter oils which were found gathered or condensed in the ordinary condenser was a point he was not very clear about. Whether it was possible to pass the gas to the holders with these in suspension he was not prepared to say, but there was a vast amount of illuminating matter at present lost in that process. He did not see why they should not be able to utilize the whole of them instead of, as heretofore, sending them into the tar-well.

Mr. P. Simpson (Rugby) said it occurred to him, that in an 8 or 10 inch pipe, the heavy tars would be at the bottom, and the lighter at the top, so that the gas would scarcely touch the former.

Mr. J. M. Darwin (Longton) said he certainly thought that working with high heats there was no advantage in keeping the gas in contact with the tar so produced, which was generally thicker, and he should be inclined to think such tar would rob the gas of its best qualities. In working with moderate heats he had found an advantage in keeping the gas in contact

with the tar as long as possible, and had a length of 12-inch pipe put round the inside of the retort-house almost level with the hydraulic main, and which pipe was also continued under the retort-house floor. The gas used to flow at a high temperature direct from the hydraulic main to an outside condenser, and he was much troubled with naphthaline. Since adopting the 12-inch length of pipe, the temperature was much reduced before it reached the condenser, and he had found no trouble with naphthaline, and had gained a more even and better quality of gas.

Mr. J. S. REEVES (Bilston) said he was rather surprised at the remarks which had been made advocating the separation of tar and liquor from the gas at an earlier stage than was generally done. Some years ago great attention was given to the subject, and the passage of the gas through long pipes together with the tar, was said to be a curative for the deposit of naphthaline in the mains and services. In the works he represented they had been troubled very much with stopped service-pipes, but since arranging for the tar to be taken along with the gas round the retort-house, the stoppage of service-pipes with naphthaline had entirely ceased. In going over the Saltley works that morning, he saw provision was made for separating the tar from the gas at the end of the hydraulic main. He supposed that plan was adopted.

The PRESIDENT remarked that this was the old plan in the old section of the works.

Mr. J. S. CRANMER (Stratford-on-Avon) said at the works he represented the gas and tar were taken away together from the hydraulic main, and when the gas reached the condenser its temperature was from 130° to 150°. His condenser was perhaps different from many. He had a pipe condenser, but with a double row of pipes throughout, so that the gas had the opportunity of taking either row. It was a vertical condenser, with 12-inch pipes, in two rows, as he had said, front and back; and the action of the gas in its passage was rather peculiar. One day—perhaps part of one day—it would travel through one or two of the back pipes, then come to the front, and afterwards go back again. He also found that the gas at the outlet was usually of the same temperature as the air, but that a very large quantity of light tar or light oils was carried forward. In fact, he did not find that the gas was condensed as much as it should be, by a very great extent. He did not think, however, that the variations he had named made any difference to the illuminating power of the gas. To him it seemed difficult to know when to commence and when to finish condensation, the opinions of the various speakers differing very considerably as to the best methods.

Mr. T. LAYTON (Redditch) said he was in much the same position as the previous speaker, as to the tar being carried beyond the condensers in such quantities. Within the last few months he had put up a 12-inch annular condenser, being about double the size of the former one, and at the outlet the gas was about the same temperature as the atmosphere; but, notwithstanding, there was double the amount of tar deposited. Last winter, when he had six beds of ovens at work, he had to have the pump used once a day, and now with four beds at work, the pump had to be used twice a day. In answer to Mr. Stevenson, he said he did not notice that there was a difference elsewhere—he obtained a great quantity of tar beyond the condensers, and he would have to make arrangements to take it off, pumping off occupying too much time.

The PRESIDENT: Does the scrubber drain into where there is this accumulation of tar?

Mr. LAYTON replied that it did, and he had been considering whether there was any condensation in the scrubber that would cause it. He knew nothing of naphthaline in the works.

Mr. PATERSON said it would not be from condensation, because the gas was reduced to the temperature of the air before it entered.

Mr. WOODALL said that in addition to the ordinary condensation he employed a most efficient scrubber after the Körting steam-jet exhauster, and that was, of course, followed by another set of condensers, which a second time reduced the temperature of the gas to that of the atmosphere, and still he found traces of tarry matter in the gas as it entered the purifiers.

Mr. J. TINDALL (Walsall) said he had had a good opportunity of proving whether it was better to take the gas direct from the hydraulic main to the condenser and rapidly condense it, or whether it was better to condense it gradually along a long length of exhaust main; and he had always found a better illuminating power when he had passed the gas along a long length of main and had had less trouble with naphthaline. He believed that if gas was taken off the hydraulic main, and rapidly condensed, it lost, by gradual condensation, some of the vapour of those lighter oils which would otherwise have been carried forward with the gas. On the other hand, if the tar was kept in contact with the gas, until it was reduced to the mean temperature of the atmosphere, then again the gas gave up those vapours to the heavy hydrocarbons. Hence the gas was reduced in illuminating power. If this was so, then there must be a proper temperature at which it was best to separate the tar from the gas. In fitting up the retort-benches at the new works at Walsall, he had taken a 16-inch main round the retort-house, with a view to gradual condensation, and the temperature at which he separated the tar from the gas was about 100° Fahr., which he believed was better than cooling it very rapidly, or allowing the two to go together until the temperature reached a point at which the tar doubtless deteriorated the illuminated power of the gas. The Rev. Mr. Bowditch had proved by experiment the injurious effects which heavy hydrocarbons had upon gas at ordinary temperatures. He passed 13-candle gas through coal oil at the ordinary temperature, and it was reduced to 1 candle; but, when he passed it through the same oil at a higher temperature, it lost none of its illuminating power. He (Mr. Tindall) did not care about any particular kind of condenser—whether it was an annular, battery, or plain pipe one; it was simply a question of temperature, and how long they should keep the gas and tar together, also at what temperature the two should be separated. He obtained the best results when he separated them at about 100° Fahr.

Mr. ANNAN said they were talking about separating the gas from the tar, but it was done for them. They did not require to do it. If they took a glass pipe as large as they could get it, say not less than 1½-inch diameter, and allow the tar and the liquor to pass along it, they would find the gas on the top, the light oil or tar below, water beneath the light oil, and the heavy tar underneath all; and except when going round a bend, turned downwards, the heavy tar did not mix or touch again. The gas could only pick up from what was floating on the top of the water, unless there was a mixing at the turns downwards.

Mr. WOODALL said that what Mr. Annan called heavy tar might condense at a temperature of 120°.

Mr. ANNAN replied that he would take away the tar from the gas in the mains as soon as it was made.

Mr. PATERSON thought Mr. Annan had hardly gone to the bottom of the matter in this exposition. He was only speaking of what he had seen in a glass tube which was having passed through it the products of previous condensation, and the gas which had been left.

Mr. ANNAN said that he took it out of the retort, and allowed it to go out of the hydraulic main and passed it on.

Mr. PATERSON said that was just what he maintained—that Mr. Annan was speaking of the effects of previous condensation, which had dropped the heavy tars and some of the lighter oils, and had left the gas, which was comparatively uncondensed. But he thought if Mr. Annan went to the end of the pipe he would still find some tar and liquor there.

Mr. STEVENSON said Mr. Annan's remarks did to some extent explain how it was there was not much damage done to the gas from condensation.

The PRESIDENT thought Mr. Paterson's point was that the tar ought to be withdrawn from the hydraulic main separate from the gas. But what Mr. Simpson and Mr. Annan wished to show was, that if it was carried along a horizontal pipe, it was so covered by liquor that it could have little or no effect upon the lighter hydrocarbons remaining in the gas.

Mr. ANNAN said he thought his statement was practically the same as Mr. Paterson's.

Mr. WOODALL said Mr. Annan assumed that all the tar fell to the bottom of the main, and was then covered with the liquor. But it was formed before, on the top and sides, where the water could not cover it, and it was this tar that was subjecting the gas to its action. That which fell upon the bottom was a very small proportion of the whole.

Mr. ANNAN: It is a very large proportion.

Mr. WOODALL said it covered an area of 2 or 3 inches in a 14-inch pipe; whereas the circumference of the pipe was 42 inches.

The PRESIDENT said in that case it would make little difference what form of condenser was used, the horizontal or the vertical, because in either case the surface of the pipe must become coated. It almost seemed that the horizontal condenser would be the better, because the heavy tar, as it condensed, would fall and become covered with liquor and the lighter oils. Reverting to the discussion, he considered it had been so exhaustive that there was very little left for him to say. But the subject altogether seemed to be in a most delightful state of uncertainty, and it was lamentable, as Mr. Woodall had pointed out, to think that after the lapse of many years they seemed to be now reversing their processes, and yet not arriving at the truth of the matter. In considering how best to accomplish the object they had in view, they had to consider what was the substance they had to deal with. That, he was afraid, few of them had done, and therein lay the root of the difficulty. Leaving the retorts, there was the form of vapour, the substance they called tar, and there were also the hydrocarbons. At what temperatures were these latter condensable, and were they affected by any other influence to which, in the process of condensation, they might be exposed? On this point he would recommend them to study the thoughtful papers by Mr. R. H. Patterson, now being published in the JOURNAL OF GAS LIGHTING, and endeavour to carry out upon their respective works a series of observations with the view of establishing or otherwise the correctness of the opinions therein advanced. He trusted this practical result would follow from their meeting that day. He himself, however, was disposed to think, as the result of his own observations, that it was possible so to condense coal gas as to leave in it very little of illuminating power, and if that were so, it was difficult to imagine that the point of safety had been reached by withdrawing the tar at the temperature of 60°. Then there was the question as to how best they could reduce the temperature. Horizontal condensers could never be so effective as vertical, for this reason—that they carried along with the gas the products also of condensation—viz., tar and ammoniacal liquor; thus adding to the work which the condensers had to perform. This, however, must be regarded as of minor importance, and should be regarded as subservient to other considerations. The difficulty which Mr. Layton referred to was inherent to the process of condensation. The temperature of the gas could readily be reduced to that of the atmosphere, but the whole of the tarry particles would not by that means be got rid of. Nothing but effective scrubbing would thoroughly eliminate all traces of tar.

Mr. ANNAN asked if Mr. Paterson considered that the gas passed off from the retorts at a very high temperature.

Mr. PATERSON said in carrying out his tests he took every precaution to prevent radiation exerting its influence upon the thermometer. The heat of the gas in the ascension-pipe at the mouthpiece was so high that the mercury boiled, and he had very speedily to extract it to save his thermometer. But he ranged at the pipe until he found it low enough; and then he found that at a foot or two from the mouthpiece it was from 500° to 600°. In answer to Mr. Stevenson, he added that he was speaking of results obtained soon after the charge was put in. At the close it would be very much less.

The PRESIDENT said some time ago he made some observations upon the temperature of the gas in the ascension-pipe, and he thought the figures were published in the JOURNAL OF GAS LIGHTING at the time. The charge was an ordinary one, and the tests were made periodically from the beginning to the end of the charge.

Mr. ANNAN said he had a strong opinion that the results obtained by Mr. Paterson would be from the heat of the retorts.

Mr. PATERSON said the simple way to test that would be to try it without any coal being put in.

The PRESIDENT then called upon Mr. Winstanley and Mr. Peaty for a description of "Hislop's Patent Process for the Revivification of Spent Lime."

Mr. H. PEATY (Longport) said that owing to a great press of business, sufficient time had not been given to the paper. A few notes had, however, been prepared, which might be enough to introduce the subject. They were as follows:—

Report on Hislop's Patent for Converting the Spent Lime of Gas-Works into Quick Lime.

In June last, Mr. Winstanley and myself paid a visit to the gas-works at Paisley, to examine Mr. Hislop's method of converting the spent lime of gas-works into quick lime. We propose to give a brief description of the process and our opinion of its merits.

The kilns used were in one of the retort-houses, part of the retort-bench being adapted for the chambers. The whole arrangement consists of a series of four chambers set one above another, heated by a furnace underneath. In the uppermost chamber, which is called the drying chamber, the charge of foul lime, consisting of about 15 cwt., is placed, and remains there till red hot, and consequently all moisture is expelled. When ready this charge is delivered into the chambers below, through an opening in the floor of the upper, the charge being equally divided between the chambers underneath. These, with their contents, are kept at a white heat for six hours, the lime being stirred three times during this period. The lids are then taken off, and the charge drawn into an iron barrow, precisely in the same way as a charge of coke from a gas-retort. The quick lime appears as a light brown powder, which turns white when treated with water, and it then appears as the ordinary hydrate of lime.

The shape of the chambers is that of a large flat D retort, having an opening near the end to allow the furnace gases to pass over and through the lime the whole length of the retorts, finally passing into the drying chamber above, and through the flue into the chimney. This method effectually changes the sulphide of lime into carbonate of lime, till the intense heat converts it into quick lime.

Mr. Hislop is now using lime which has been restored upwards of a hundred times, and claims that the lime thus restored is as effectual as when first used.

Having ascertained that the work is complete, we will consider it from a financial point of view. The cost of erection of two sets of chambers with their furnaces is about £75 or £80—we will say £80. Mr. Hislop's experience is that 700 to 800 tons of lime can be produced before renewal of portions of the chambers, and 2000 tons before the whole requires resetting and renewing. In works using 400 tons of lime per year, partial renewal will be required every two years, and reconstruction every five years, besides wear and tear of furnaces. Interest on outlay at 10 per cent. per annum will be £8. Wear and tear and reconstruction when worn out —say, £20 per annum. The charge per ton of lime used will therefore be 1s. 5d. One man at 4s. per day can produce a ton of lime a day; and the cost of coke for each ton will be 1s. 6d. The cost of royalty is 7s. 6d. per million cubic feet of gas produced. The quantity of gas purified by one ton of lime varies very much in different works, but estimating that three tons of lime purify a million feet of gas, we have a royalty charge on each ton of lime of 2s. 6d.

To recapitulate: The charge is, on each ton of lime, for—

Interest and renewal	1s. 5d.
Labour	4 0
Coke	1 6
Royalty	2 6
	9s. 5d.

It is evident that each of these items will vary according to circumstances. Where but little lime is required, the charges for interest and renewal will be higher. Where a small quantity of lime is used in proportion to the make, the charge for royalty will be higher. Where coke is high in price, the charge for firing will be proportionally high.

Mr. Hislop calculates that the cost of renewal on his works is about 3s. per ton, and as he cannot obtain fresh lime under 16s. per ton, a saving fo 8s. per ton is effected.

No mention has been made at present of any alternative method of disposing of the spent lime. We know some can sell this refuse for 2s. 6d., 3s., or even 4s. per ton; others have to cart it away themselves, so that in large works, and away from easy reach of the farmers, it is a serious consideration how to deal with it.

Mr. G. Livesey, in a paper read before the British Association of Gas Managers in 1876, has this passage, "Supposing the whole of the London Gas Companies included in the Act of 1860 to be compelled to deal with the sulphur compounds according to the Referees requirements, and supposing further that the quantity of lime used at Bow Common to be taken as the basis of the calculation—viz., 17 tons of coal to one yard of unslaked lime, which increases to about 2 yards of foul lime, we find that after purifying the gas from 1,500,000 tons of coal—the quantity used in 1875—there will be some 166,000 yards of foul lime to be disposed of, sufficient to cover an area of 34 acres one yard deep. What is to be done with it?"

Yes, that is the question. Some sell it at a profit; some grind it up with ashes, and sell it as mortar, or use it as luting; some, as in my case, have to give it away; others, more unfortunate, pay to have it removed.

In conclusion, we think that the process is a most valuable one, and in many places would be a great step in economical working, without noticing prominently the undeniable advantage of having the supply of lime in the manager's own hands.

(Signed) H. Peaty.

Mr. Paterson inquired as to the possibility of a nuisance arising from the reburning of the lime, remarking that this became a vital question in many towns, especially fashionable watering-places. A great deal of security against nuisance would depend upon the extent to which the lime was carbonated before being reburnt. He could easily see that if a little sulphide was left in the lime there would be no chance of nuisance in reburning it.

Mr. Stevenson asked if it was not the fact that the ovens were situated in the retort-house. If so, and the emanations from the ovens were taken out with other fumes by the retort-chimney, they would be converted into sulphurous acid, and would be very little nuisance.

Mr. Woodall said if 20 per cent. of the retort-house was taken up in the carrying out of the process, then 20 per cent. of the cost of the land and buildings must be taken into account in estimating the cost of adopting the process.

The President asked if he correctly gathered that a ton of the revivified lime went as far as a ton of the original lime.

Mr. Peaty replied that Mr. Hislop stated that it did, but he (Mr. Peaty) had no means of judging, except from the printed report.

Mr. Tindall inquired if all the sulphur that was taken up by the lime was lost.

Mr. Peaty, replying to the various questions, said when he and Mr. Winstanley were at Paisley they did not notice any particular nuisance. The lime appeared to be very much carbonated. He saw little sulphide of lime in that which was being manipulated. It was dealt with by taking the fumes away by the blast out of the chimney. In the same way he was dealing with sulphuretted hydrogen produced in the manufacture of sulphate of ammonia at the works with which he was connected.

Mr. Paterson: That is sufficient to create a nuisance.

Mr. Peaty said every large chimney must be a nuisance more or less, but he had had no complaint. As to the cost, four tons make in a day and night, or about 1400 tons a year, would need very small plant. If not placed in the retort-house, it might be put near the engine-house stack, in such a position as that a connection might be made. The sulphur would be entirely lost, no means having been discovered of keeping it.

The President proposed a vote of thanks to Mr. Annan and Mr. Peaty for their papers, remarking that both well deserved the thanks of the Association for the trouble they had taken.

Mr. Paterson, in seconding the motion, said the meeting had been a very instructive and gratifying one.

The motion having been agreed to,

Mr. Annan proposed the election of Mr. Simpson, of Rugby, as President for the ensuing year. He said Mr. Simpson was well known to them all as a shrewd, intelligent, and able man in his profession, and he felt sure the meeting would accept the proposition with as much pleasure as he moved it.

Mr. Stevenson seconded the motion, which was supported by the President, and unanimously agreed to.

Mr. Simpson, in acknowledging the confidence of his fellow-members, said he felt himself unsuited for the post, and he would therefore throw all responsibility for the consequences upon those who had elected him.

Mr. Paterson next proposed the election of Mr. Tindall as Treasurer. He said they all knew how much this gentleman had the interests of the Association at heart; and as the position of Treasurer was one of considerable dignity, and Mr. Tindall was a member of the Committee, he thought they could not do better than translate him from the office of Honorary Secretary to the higher honour of Treasurer.

Mr. Darwin seconded the motion, which was also unanimously agreed to.

Mr. Tindall, in acknowledging the compliment, said his interest in the Association would not be abated by change of position. The duties of Honorary Secretary he felt required more time than he was able to give to them; he should, therefore, be glad to make the change, and hoped the appointment of another to his late post would prove beneficial to the Association. In conclusion, he warmly acknowledged the kindness and courtesy with which he had been treated by every member of the Association.

Mr. Paterson proposed the election of Mr. W. North, of Stourbridge, as Honorary Secretary. He said there could be only one opinion of Mr. North's fitness for the office, all knowing his energy and capability, which would enable him to fill it with honour to the Association.

Mr. Reeves seconded the motion, which was carried unanimously.

The President announced that the two members to retire from the Committee had been decided by lot, which had fallen upon Mr. Paterson and Mr. Annan.

It was resolved that Mr. R. Morland (Gloucester) and Mr. Peaty be elected members of the Committee in the place of those retiring.

On the motion of the President, seconded by Mr. Cranmer, Mr. Storer and Mr. Cross were unanimously re-elected Auditors.

Mr. Annan proposed a very hearty vote of thanks to Mr. Tindall for the excellent way in which, to the satisfaction of the Committee and the members generally, he had discharged the duties of his office.

The President said he seconded the proposition with great pleasure. He had come in contact with Mr. Tindall more than any other member of the Association, and could testify, from many opportunities of observation, to the zeal and ability he had brought to bear upon the discharge of the duties of his office.

Mr. Simpson supported the vote, remarking that there was always a great deal of hard work to do in connection with the starting of a new Association, and Mr. Tindall had his share in this case, and had come out of it with credit.

The vote was heartily accorded.

Mr. Tindall said he very much appreciated the kindness manifested by the proposer and seconder of the motion, and the reception of their remarks by the meeting. From Mr. Hunt he had received every assistance, or he should not have been able to do even what he had towards the formation of the Association. He considered that the Association was fairly established, and he hoped and believed it would be more successful and prosperous in the future than it had been in the past; but as regarded the business done up to that time, he thought it would bear favourable comparison with other District Associations.

Mr. Stevenson proposed a vote of thanks to the retiring President for his services during the past year, and especially for the part he had taken in the arrangement of the proceedings. They had had a most enjoyable meeting that day, and the pleasure they had derived from the visit to the works, and from their social intercourse, was due to the President.

The President acknowledged the cordial reception of the proposition, and said his connection with the Association had been a source of considerable pleasure to him, and would, he trusted, continue to be so, for he should always take a great interest in its proceedings, and hoped he should be able to attend the meetings as regularly as he had hitherto done. He brought very little experience with him to the post of President, and but for the kindness of his brother members the task would have been an arduous one. Their kindness had, however, carried him through, and made the position very pleasant.

The meeting then ended, and the members afterwards took tea together in the hotel.

WEST OF SCOTLAND ASSOCIATION OF GAS MANAGERS.

(*Continued from p.* 633.)

Mr. R. S. Carlow (Port Glasgow) read a paper, as follows, on

THE DISADVANTAGES OF MANUFACTURING AND SUPPLYING GAS WITH DEFICIENT PLANT.

You will see that I have been put down on the programme to read to you a paper on the "Disadvantages of Manufacturing and Supplying Gas with Deficient Plant." The subject is not one of my own choosing, for it was suggested to me by one of your number some time ago that, as the works which are under my care had been recently re-arranged and remodelled, I might be able to speak (1) on the disadvantages a gas manager has to contend with when he is working with plant totally inadequate to the requirements of his place; and (2) the great benefit that follows from having the best appliances that can be obtained, and the works put in the most efficient state for working. When this was suggested to me by our friend, I said that I might be able to say a few words on such a subject, and if you will kindly bear with me for a little, I will endeavour to describe to you the state of the Port Glasgow Gas-Works both before as well as after the late alterations. I think it is much better to confine myself to a short account of the works rather than treat in the abstract the subject which has been given me. It is, I think, self-evident that, with deficient plant, a gas manager must labour under many and great disadvantages in manufacturing and supplying gas, and of course it should be the aim of every one of us to inquire into and study what improved appliances can be used, and what are the best arrangements that can be made so as to get the best possible results out of our works.

The Port Glasgow Gas-Works, previous to the year 1874, were in a most defective state. In point of fact, they had become totally inadequate to supply the growing requirements of the place, and it was a question with the Town Council whether it would not be better to abandon their own works altogether, rather than incur the large expense of putting them in working order, and take a supply of gas for the town from their Greenock neighbours. It was finally resolved to alter and extend their own works, and put them into such a state of efficiency as would meet the altered requirements of the place. But before I describe the alterations and improvements that were carried out, a few words on the condition of the old works will be necessary.

First, as to retorts. The number of retorts in the works prior to 1874 was 11. I have nothing to say against the retorts themselves, but the benches were in a most dilapidated and insecure condition. The manufacture, both per mouthpiece and per ton of coal, was very small, in consequence of the limited capacity of holder room, the total amount being only 45,000 cubic feet, while the maximum daily make was 100,000 cubic feet. Constant charging was a thing quite out of the question in the works, one-half of the retorts in use having to be hung during part of the night, after eleven o'clock. All the retorts were again charged between five and eight o'clock a.m., and after this had been done, recourse to hanging had again to be taken until evening, when lighting commenced. I need scarcely add that with so much hanging, the retorts were never tight, and the amount of gas lost was considerable and incalculable. I have no actual statistics to show the exact amount of gas lost in this way, as the station-meter then in use was not working satisfactorily, in consequence of the defective state of other plant of which I will afterwards speak. The loss also was considerable, through having little coal storeage; and often coals very wet, as they came from the trucks, had to be charged.

The condenser was one of the common kind, the chest being only about 9 feet long by 2 feet broad, with sixteen 8-inch pipes, eight pipes in a row. This condenser was quite insufficient for the work it had to perform, as large quantities of tar and liquor passed right through, and lodged in the bottom of the small purifiers then in use. The temperature of the gas was not much reduced after passing through the condenser, and it had a brown, smoky appearance, and on holding a white paper to a small hole at the outlet of the condenser, the tar and liquor deposited themselves quite freely thereon.

There was one of those small old-fashioned washers, placed at the end of the condenser; but this, instead of doing any good in freeing the gas of ammonia, as it should and was intended to do, rather acted as an agent for contributing back pressure upon the hydraulic main.

There were four purifiers in number, 6 feet square and 4 feet deep. These also were far too small, and served more for the purpose of condensing the gas, and depositing the tar and liquor, than for any amount of purification that took place. The inlet-pipe entered at the centre of the bottom of the purifier, and came right up to the top. The gas had thus to force its way down to the bottom before leaving the purifiers. I consider this course to have been against the purification of the gas, for the reason that when little condensation or washing took place, the tar and liquor which should have been left in the condenser or scrubber, lodged upon the top trays of the purifiers above the lime, and made the lime quite stiff and hard, more like a layer of Caithness pavement than lime. Four rows of sieves were in each purifier, and each sieve was alike in hardness. This stiffness in the lime caused a great back pressure upon the retorts. I have seen it as high as 10 or 12 inches, and the purifiers all blowing at the lutes. It was a nightly occurrence to see the purifiers all blowing, and a fine job it was sometimes before they settled down—running off condensed tar and liquor from the pipes in connection with the eight-way valve, and turning each of the purifiers off and on until it was ascertained in which one of them the choke was, and after it was discovered, emptying and refilling it as soon as possible, and doing every conceivable thing that could be thought of to try and get over the difficulty. Complaint of bad gas was a general thing in the town; in fact, some of the *employés* in one of the largest manufactories in the town had on several occasions to leave the place they were working in, the smell of sulphuretted hydrogen from the gas being so intolerable. I had two purifiers changed each day for three days prior to one of these complaints being made, and I was at a loss to understand how the gas was getting past the purifiers in this condition. In order to find out the cause, I stationed one of the men at the inlet-valve of the holder that was filling at the time, and told him to shut the valve at once, and thus cause the back pressure of the gas to act upon the lime in the purifiers. Upon lifting the lids of the purifiers, it was found that the lime was all in cakes, and broken and lying in all directions. The action of the uncondensed gas had deposited tar and liquor upon the top of the lime, and had, when the lime was of a certain stiffness or hardness, made ruts for itself and passed through these ruts into the outlet of the purifiers, thence into the holder in an unpurified condition; and, of course, the consumers were supplied with it in this state. Besides all these drawbacks, the cost for lime and labour was enormous. For purifying 13 million feet of gas it cost £50 for lime, and even then the gas was not half purified, and a man had to be kept in the purifying-house nearly all the year round, besides extra time on many occasions when purifiers had to be changed in the dark.

Prior to 1874 there were three gasholders in use, of the following capacities:—One of 30,000 feet, one of 9000 feet, and one of 6000 feet, giving in all a storeage of 45,000 feet, while the maximum daily make was 100,000 feet. You will thus have an idea of the disadvantage it was to supply the gas in anything like a state that would give satisfaction to the consumers. When it came to ten o'clock at night, it was a common occurrence for both the manager and stoker to be standing anxiously watching the holders, expecting to see them go out of sight, and reducing the pressure to the town bit by bit until actually it could not be with safety reduced any more, and I can assure you it was a relief indeed when we found that, instead of losing, we had gained a little, and the holder was beginning to make its way up again.

Great as the difficulties were we had to contend with on account of the small holder room at our disposal, we had a still heavier trial to meet, for when the labourers were excavating for building a large new tank, the side of the old tank gave way at the foundation, and fell into the excavation of the new one. When this took place we were left with only the 9000 and 6000 feet holders to work with, in supplying gas to the town—and bear in mind the delivery was upwards (it being the month of January) of 100,000 feet per day. There was no outlet of the 6000-feet holder to the town, and consequently we had to make this light holder heavier than the larger one, which was done by putting a quantity of fire-bricks round the rim of the holder on the top of the angle-iron. By this means we were able to draw the gas from the small holder through the inlet-pipes into the larger holder, and then send it on through the pipes into the town. Some of you will think it was scarcely possible to supply 100,000 feet of gas a day with only 15,000 feet of holder capacity, but I can assure you it had to be done, and this was surely supplying gas with deficient plant at an enormous disadvantage.

It may be interesting for you to know how I managed under the difficulty in which I was placed. The morning I was called from my bed and told what had occurred, I can assure you I felt it to be a fine position to find myself in. There was little time to think, so I gave the order to kindle six retorts of the new bench which had fortunately by that time been erected, and had them ready for charging before four o'clock in the afternoon, which I did with Lesmahagow main seam coal, and with a double shift of men the retorts were kept going, and the town was supplied with gas as usual, although at a low pressure. The loss, of course, in working in this way must have been very great indeed, and to give you an idea of it would be impossible.

One of the great disadvantages a manager has to contend with is working with deficient accommodation in holder room, for if the men are not very careful in charging the retorts with the proper quantity to fill the holder, or if by a sudden stroke of sunshine the holder expands, it will get too full, and commence to blow, when you must either let it blow on, which causes a very bad smell, especially from an old holder, or you must pull the plug of the purifiers, or slack the lids of the retorts, and in either of these cases you are bound to lose a very considerable quantity of gas, besides incurring a large amount of danger.

I have thus shortly described the state of the old works at Port Glasgow, and endeavoured to show you some of the disadvantages of manufacturing and supplying gas with the deficient plant then in use. I cannot tell you exactly what it cost to manufacture and supply gas under the old process, as I have no reliable statistics at hand to show this; but it must have been very great proportionately to what it costs now with our new and improved machinery.

I would just ask your attention for a little longer while I describe some of the improvements which have been carried out at the works.

In the first place, I may state that the retort-house and coal store have been extended, and are now embraced under one roof. The span of the roof is 74 feet, and the length is 125 feet. The men do not require to go into the open air for the coal, which is a very great advantage indeed. About 1000 tons of coal can easily be stowed in the coal store, and the coals can be thoroughly dried and put in a proper state for carbonizing before they are charged.

A new double bench of 24 retorts (12 on each side) has been erected in the centre of the building, and this bench can be easily extended should the requirements of the place call for it. The make per mouthpiece at present (working shale and splint parrot, half and half) is 6500 feet, or, as near as I can calculate, 8300 feet per ton. The average illuminating power is 27 candles; and the durability of 1 cubic foot of gas with a 5-inch flame is 57 minutes—results which may, I think, be considered satisfactory.

A large condenser has been erected with forty 12-inch diameter pipes (twenty on each side), with a large bottom chest. The condenser is capable of doing three times more work than is at present required of it. The temperature of the gas during the winter months stands at nearly 90° when it enters the condenser, and last winter I have seen it leave at 47° and 48°. I may state here that a steam pipe has been led into the condenser at several places, by means of which it can be thoroughly cleaned at any time. This I consider a very good arrangement, and one I would strongly recommend, as during the time the steam is being injected into the condenser the illuminating power of the gas is increased. Of course care must be taken that the introduction of the steam be not continued for too long a period, otherwise the gas will be impoverished.

Two large scrubbers have been erected, each 16 feet high by 7 feet square, with a division in the centre of each. Three rows of perforated cast iron plates are placed at certain distances in each scrubber, and these plates I am in the habit of keeping covered with a layer of heather. The scrubbers are more than sufficient for the present requirements of the works—in point of fact, they are capable of doing three times the amount of work they have to do at present. When these scrubbers were first erected, two new pumps to work in connection with them were placed against the inside wall of the exhauster-house, and were driven with a belt from the exhauster engine; but this arrangement was afterwards found not to work well. The pumps were eventually removed, and a new engine was erected immediately alongside the scrubbers, for the purpose of working the scrubber pumps and a pump for lifting the tar and liquor from the wells. When I state that in 1873, when the works were in a very inefficient state, the amount received for tar and liquor was only £63, with a make of nearly 14 million feet of gas, you will see that we are getting very good results now with our new scrubbers and condenser, for in 1877, with a make of 19 million feet of gas, the amount received was over £300. This sum was what was received when we were working with the small pumps which I have just referred to, but after the new engine and larger pumps were erected we had better results, for within a twelvemonth an extra £100 was obtained on the tar account, and we had even a less make that year than in the one immediately preceding. The engine and pumps cost only £110, so that they have at all events paid for themselves, and you will see that very great saving and economy have been effected through their use. Wherever such an engine and pumps can be used, I would strongly recommend them, as I consider the proper extraction of ammonia from the gas to be one of the matters to which a gas manager should direct his most careful attention, and when this is properly attended to, a considerable addition is made to the revenue of his works.

A new exhauster has been erected, and I consider this a most valuable machine; as, by means of it, a large quantity of gas, that would otherwise be lost, is drawn through and sent on to the station-meter for registration. Wherever retorts are porous and leaky, or joints defective, the exhauster has the power of drawing the gas gently past the defective place, where it would otherwise be lost, and passing it, as I have just said, on to the station-meter. Perhaps I should state that I am in the habit of working this machine so as to have the pressure as near zero as possible, and when I allow it to be thrown out of gear, I have in no part of the works more than 4 inches of back pressure.

Three new purifiers have been erected in the works, each of them 14 feet square, and they hold about 6 tons 10 cwt. of slaked lime; four rows of sieves are on each of the purifiers, and each of the sieves has on it an average of 6 inches of lime in depth. It is a thing of the past to have a choke in the purifiers, or to have any of them blowing. It is a pleasure to work them. One purifier only requires to be changed in a fortnight in the dead of winter, and one man can empty and fill it in a day. The total cost for purifying 19 million cubic feet of gas is now £96, and six weeks of a man's time in a year will change all the purifiers I have to change.

The present capacity of the holders in the works is 160,000 feet, and one of them has been left so that it can easily be made into a telescopic holder, which will give increased holder capacity at very little extra cost. I have now never any cause for hanging retorts, and when the charging is done it is always done regularly, and at the proper hours.

Formerly there was no governor in the works; but a good one has now been erected, and a given pressure can always be maintained, and a saving of gas by this means effected.

The station-meter at present in the works is the old one that was formerly used, but it was put into thorough repair, and is now doing its work well.

I have said nothing as to the state of the outside plant. This department of the works has only recently come under my care. It is not, I am sorry to say, in a satisfactory condition, a great number of the meters, and also main and service pipes, being very defective; but the Commissioners have given orders for the thorough overhauling of the outside plant. The work has already been commenced, and is being prosecuted by degrees. I hope that in the course of another year the outside works will be in as good and as satisfactory a condition as the inside works now are.

In conclusion, gentlemen, I have endeavoured to show you the state the Port Glasgow Gas-Works were in prior to 1874, and the great disadvantages that had to be contended with in manufacturing and supplying gas at that date with the deficient plant at my disposal. I have also tried to give you an idea of the alterations and appliances that have been added to the works, and the great facilities we now possess, as compared with the former times; and I hope the reading of my paper may be of use to some of the members present. It is, I am well aware, far from being a perfect production, but I am sure its demerits will be gently treated at your hands.

Discussion.

Mr. FULLERTON (Motherwell) asked how many retorts Mr. Carlow had in use between six and ten o'clock in the evening when he had to supply 100,000 cubic feet of gas a day.

Mr. CARLOW said there were 17 in all.

The PRESIDENT said he was almost in a similar position to that in which Mr. Carlow was placed last winter. He had 80,000 feet of storeage, and required 240,000 feet of gas in 24 hours. Things had now improved with Mr. Carlow as well as with himself, and they could both look forward to dark weather with the satisfaction that if all went well they would be able to meet the demand for gas. He thought a vote of thanks should be awarded to Mr. Carlow for his paper. There were many points in it which might escape observation on its first reading.

Mr. M'GILCHRIST (Dumbarton) said he was very pleased to have heard Mr. Carlow's paper. Mr. Carlow had presented a vivid picture of his old

works and the difficulties he had experienced, and he had in equally vivid language described the excellent condition of his new works. One thing he had omitted which might advantageously have been included—namely, the cost per 1000 feet of gas made under the disadvantageous system, compared with the cost of production in his new and extended works.

Mr. Carlow said he could not give such an account, because he had often to borrow and call in additional labourers, and the additional expense was charged to capital account; besides, a certain amount of gas went up the chimney, in consequence of the retorts being defective.

Mr. Niven (Dunoon) questioned the propriety of giving the information Mr. M'Gilchrist asked for, even if it had been possible.

Mr. M'Gilchrist said the information he desired would have been of great value, because he knew many directors who would not give their managers plant when it was applied for; also many works where, until quite recently, there never had been a station-meter or a governor. If they could show the benefits resulting from improving dilapidated works, it would give directors something like an idea of the loss sustained through working with insufficient plant.

Mr. Brodie (Paisley) said he had something to do with the Port Glasgow works, and knew the predicament in which Mr. Carlow was placed. There was something in Mr. M'Gilchrist's question which was to the point. He thought the nature of the paper was to make a comparison between dilapidated works and works which had been remodelled, and the information desired by Mr. M'Gilchrist would have proved very valuable.

The President said, with respect to the cost, he might mention that in his old works, with imperfect washing and scrubbing power, and a too small purifying area, the purification of gas in the month of December cost about 3d. per 1000 feet, while just then he was purifying in new works for less than ¼d. per 1000 feet. This showed the advantage of a large area for purification.

Mr. Watson (Stirling) said he could corroborate that statement. A scrubber would pay for itself in two years.

Mr. Carlow said that he was very pleased with the way in which his paper had been received. It was his first production, and he trusted he might be able to read another paper at some future meeting. He might not in this paper have given the amount of information desired by the members, but could take up one subject specially at another time, and try to give some figures, which would be better than a history of the works at Port Glasgow.

(To be continued.)

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

There is a more healthy tone throughout the coal trade of this district, so far as round coal is concerned, and there is every probability of a general advance in pit prices at the close of the month. In anticipation of this, buyers are displaying considerable anxiety to place forward contracts, but with very little success. House-fire classes of fuel are in good demand, and colliery proprietors are being pressed for deliveries. The lower classes of round coal, used for steam and iron-making purposes, are also in better demand; but in this branch of the trade no general pressure is yet being felt, the increased demand for forge coal being chiefly confined to the rolling-mills, many of which are now taking their usual quantities. Burgy continues in only poor demand, owing to the depression in the cotton trade; and slack, although in some districts more of this class of fuel is being used, is still plentiful, colliery proprietors in many cases being not unwilling to contract for next year at present rates. Generally there is a stiffening up in prices, and at the pit mouth they may be quoted about as under:—Best Wigan Arley, 8s. to 8s. 6d., with 9s. per ton being asked in some cases; common Arley, 6s. 6d. to 7s. 6d.; Pemberton four-feet, 6s. 3d. to 6s. 9d.; common round coal, 4s. 9d. to 5s. 6d.; burgy, 3s. 9d. to 4s. 3d.; good slack, 2s. 6d. to 3s. 3d., and common, about 2s. per ton.

The shipping trade is moderately active, and sellers are able to obtain slightly better prices than have been ruling of late.

Coke is in better demand, and this class of fuel is not now being pushed in the market as it was a short time back.

In the iron trade, although there is not at present a large demand, and there has been some underselling on the part of dealers, the market is generally steady, and makers as a rule are firm holders at their full prices. For Lancashire pig iron the quoted prices for delivery into the Manchester district remain at 53s. per ton for No. 3 foundry, and 52s. for No. 4 forge, less 2½ per cent. Finished iron is decidedly stiffer in price, and as forge proprietors are now generally well supplied with orders for several months ahead, they are holding out for the advance of 20s. per ton which was decided upon a few weeks back, Lancashire bars delivered into the Manchester district being now quoted at about £6 10s. per ton.

THE COAL AND GENERAL TRADES OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

More steam and sailing tonnage reached the Tyne and northern coal ports in the latter part of last week. A fleet of light collier vessels were reported on their passage down with a favourable south-west wind. In the early part of the week some of the gas companies were very urgent to have cargoes sent away to them. As much as 9s. 6d. a ton was paid a steamer to take a cargo of gas coals to Dublin, which was a rise of fully half-a-crown a ton upon the last business transacted thence. Sailing vessels were engaged on Friday last to load gas coals in the Tyne at the following rates:—Exeter, 7s. 9d.; Newhaven (large vessels), 6s.; Poole, 7s.; Cowes, 6s. 9d.; Woolwich, 6s.; Chatham, 5s. 7½d.; Devonport, 6s. 7½d.; Cherbourg, 6s. 9d. The principal Durham gas collieries seem to have secured more tonnage as turns are about filled up.

The orders in the market are pretty numerous, and as the tonnage anticipated will considerably exceed what is at command at present, an active business may be predicted over the next fortnight. The price of gas coals is unaltered. Freights generally have taken an unexpected rise coastwise, and for most parts of the world. There is no hope of much reduction in them until steamers come out of the Baltic, which will be about three weeks hence.

The Durham gas coke trade is steady. Better prices are paid. The prospects for next year in this trade are more satisfactory. The other branches of the north country coal trade are quiet.

The general manufacturing trade of the North of England is stronger. The rate of progress in some branches of business is slow but steady. Chemicals have risen very much in price. The business doing is upon *bond fide* orders. The chemical transactions last week were large. The most satisfactory feature in connection with this business is the fact that crystals of soda, which were selling a month ago at £2 12s. 6d. net, were contracted for last week at £3 10s. per ton, to be delivered over next year. Other articles have not risen so much, but they show a substantial advance. Fire-clay goods of the best qualities maintain their position in the market.

A very superior class of new steamers are placed on the coal trade between the Tyne and London. The new boat *Gracie* arrived in the Tyne from London on Friday morning, after a passage of 24 hours. She had only sailed from the Tyne for the Thames on Tuesday, with 1730 tons of coal. She made the run to London in 26 hours. Upon her return voyage she did the distance to the Tyne in 24 hours.

TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

Since despatching my last budget of "Notes," I have learned that it has been definitely resolved to hold an exhibition of gas apparatus in Paisley during the month of December. It will be opened on the 15th and closed on the 26th of that month. The Drill Hall, which is very commodious, and otherwise most suitable, has been secured for the exhibition. Judging by the extent and variety of the exhibits which all the leading manufacturers of gas apparatus have cheerfully promised to send, there is some prospect of the exhibition being even more successful than the one recently held in Greenock.

A reduction in the price of gas has been made at Invergordon, in Ross-shire, amounting to 2s. per 1000 cubic feet, or from 12s. to 10s.

In order that they may be enabled to pay the cost of the newly-acquired gas-works, the Town Council of Peterhead have just obtained a loan of £12,000.

It seems that the movement for the adoption of the Police and Improvement (Scotland) Act at Markinch, Fifeshire, has already resulted in some good to the community, the street-lamps having again been lighted. This is the result of efforts made by an opposition party, the members of which held a meeting on the evening of Saturday, the 18th inst., when it was at once resolved to collect subscriptions for the purpose of having the lamps re-lighted, their cry being "Light, more light;" and there is the prospect of a small tax being levied for putting in force certain clauses of the above-named Act. Party feeling is running very high in the town, but it is said that the majority of the inhabitants are in favour of the adoption of the Act.

The monthly meeting of the Forfar Gas Commissioners took place on Monday, the 20th inst., when attention was drawn to the recent accident at the gas-works. Mr. Whyte remarked that the Commissioners would have a very serious difficulty to face in the shape of additional storeage at the works, which question had been shelved last year because of the agitation in connection with the electric light. Part of the cause of the accident was the want of such accommodation. Bailie Laird replied that he did not think that the scare should be brought up at present, for the reason that it was not desirable to have to go to Parliament in the meantime, which it would be necessary for them to do if they were to erect an additional gasholder, while the cost of going to Parliament would probably be £500 or £600. He did not think the ratepayers would approve of such an expenditure. As to the accident, he said that the storeage had nothing to do with it. The fact was that a great many retorts had been put into the works, so that the Manager was finding no great difficulty in keeping the town well supplied; in fact, the damaged gasholder was now standing idle. Mr. Whyte again spoke, and denied that there was any scare. All he had to do was to ask the Manager, who was in attendance, whether or not the storeage at the gas-works was sufficient. Mr. Esplin (the Manager) said his reply to that was that the storeage was not sufficient for the maximum, or anything like the maximum day's supply for the town of Forfar. Mr. Ewen and other Commissioners spoke in the same strain.

The electric lighting experiment is still going on at the St. Enoch Railway Station, Glasgow, and it would seem that the Glasgow and South-Western Railway Company's Directors, assisted by two of their colleagues from the Midland Board of Directors, had the matter under consideration at their weekly meeting last Tuesday. It is reported that all the Directors are very much pleased with the success which has recently attended the experiment, and that they are now only waiting to learn the comparative cost of lighting by electricity and by gas.

On Tuesday last the Stirling Water-Works Commissioners held their annual general meeting. A statement of the income and expenditure for the past year was submitted and approved of. It showed that the income was £2684 7s. 6½d., and that the expenditure amounted to £3550 11s. 10d., leaving a deficiency of £866 4s. 3½d., the assets being of the value of £506 11s. 7d.

At a meeting of the Greenock Water Trust, held last Tuesday, it was reported that the sum of £5064 18s. 8d. had been expended on the Loch Thorn extension works, and that the quantity of water in the various reservoirs was equal to a supply of 128 days for all purposes.

After considering the subject for several years, the Wishaw Burgh Commissioners are now about to carry out a scheme for the extension of the water supply of the town. It has been agreed to construct a reservoir capable of containing 64 million gallons, or 50 million gallons more than the present storeage. The work is almost ready for being put into the hands of the contractors. Including a new main to the burgh, the cost will be about £10,000.

A good deal of fluctuation in the price of pig iron again took place last week, the lowest price being 53s. 10½d. cash on Monday, while up to 55s. 7½d. was paid on Friday; the closing quotations, however, being 55s. cash prompt, and 55s. 4½d. one month.

No very material change has taken place in the condition of the coal market, nor is there likely to be any further advance of wages in the meantime to the miners.

Glasgow Water Supply in 1859 and 1879: A Correction.—In one or two points corrections must be made in the remarks of Mr. Mayer, reported on page 631 of our last issue. Prior to the opening of the Loch Katrine Water-Works in 1859 the daily supply of water to Glasgow was 16,840,000 gallons (and not simply 16,000 gallons as there given by mistake); and the supply now, after the lapse of 20 years, is 37,740,000 gallons (instead of 37,740 gallons). Another mistake is in reference to the price by meter in 1859, which was only 4·8d., and not 4s. 8d. per 1000 gallons. [We may state that Mr. Mayer himself supplied the account we published, and the first two mistakes occur in his "copy," while the third was caused through indistinctness.—Ed. J. G. L.]

Bolton Corporation Water Supply.—From the annual abstract of the accounts of the Corporation of Bolton, for the financial year ending June 30 last, prepared by Mr. Swainson, the Borough Treasurer, and just issued, it appears that, during the twelve months, the water-rental amounted to £35,543, as against £32,463 the previous year, or an increase of £3080. The receipts from water sold by meter increased from £9010 to £11,230, and the quantity of water thus consumed increased from 333,291,000 to 411,550,000 gallons. The profit from the fitting trade amounted to £1463, as compared with £1541 the preceding year—a decrease of £78; and the miscellaneous receipts and interest to £271, as against £484. There was paid for salaries £1669, as against £1352, and the maintenance of works is set down at £1941, or £148 less than the previous twelve months; whilst the rent-charges amounted to £4648, and the compensations to £147. The rates and taxes were £2092, and the rents £1214. There were paid for interest on loans, and commission charged by bankers, the sum of £18,742; on sinking-fund account, £1070; and as instalments of Public Works Commissioners loans, £1233. Already £3000 has been transferred to the

borough fund in aid of rates, and £1865, the balance of profits, remains to be carried forward. This shows that the water-works department, having £658 in hand from the previous year, made a net profit of over £4200. On capital account, £16,850 was received in loans at 3½ and 4 per cent., whilst £25,900 was paid off, for which 4 and 4½ per cent. had been given, and a further sum of £10,000 was also paid off, upon which 4½ per cent. was allowed. In making additions to old works there was spent during the year only £204. In extension of mains £2818 was absorbed; the Wayoh reservoir and works cost £2846; and the Entwistle reservoir and works £888. Under the head of "Parliamentary expenses," the Corporation's opposition to the Manchester and West Houghton Water Bills is stated at £173. Under the head of "Stock account," the value of the water-works is stated at £640,000, but £57,869 of debt has been paid off through the sinking-fund.

Extension of the Batley Corporation Water-Works.—On Saturday, the 18th inst., the ceremony of turning the first sod of the Ramsden reservoir, the third of the four reservoirs in connection with the Batley Corporation Water-Works, near Holmfirth, was performed by the Mayor (Alderman R. Talbot). The two present reservoirs yield a supply of about a million gallons a day. The Ramsden reservoir, when completed, will, it is calculated, hold 502,700 gallons of water, being a supply for 150 days in time of drought, and in ordinary times it will yield 600,000 gallons a day. The drainage of the proposed reservoir is 1600 acres, with an additional drainage of 692 acres for compensation. Mr. J. F. Bateman, C.E., is the Engineer of the works, and the construction of the reservoir will be carried out under the superintendence of his Assistant, Mr. G. H. Hill, C.E., and the Resident Engineer, Mr. Smallpiece.

Destruction of Cast-Iron Gas-Mains.—A curious case of deterioration of cast-iron gas-pipes has recently been observed at Saarbrücken. The pipes in question had been laid for ten years, and when removed were found converted into a soft substance, which could be cut with a knife, and, on analysis, was found to contain only 52 per cent. of metallic iron. The pipes were laid in channels cut in soft sandstone, filled in with ashes from locomotives. The coal which produced these ashes was from the Saarbrücken basin, and was relatively rich in sulphur. The destruction of the pipes was most probably due to the action of the sulphur contained in the ashes, combined with the oxygen of the atmosphere. This view is supported by the fact that the substance into which the pipes had been changed contained 1½ per cent. of sulphuric acid. A large number of pipes were completely destroyed, and had to be renewed.

Spennymoor Public Lighting.—A difference has recently arisen between the Spennymoor Local Board and the Gas Company as to the public lighting of the district. The Gas Company—who, up to the end of last month, were charging private consumers 4s. per 1000 feet, but have since reduced the price to 3s. 9d.—offered to light the lamps from sunset to sunrise, for the eight months from September to April (excepting during the time of moonlight, when the lamps were to be extinguished three nights before and two nights after the full moon), for the sum of £3 3s. per lamp; or £1 9s. each if the lamps were extinguished at midnight—the Company to do all the work incidental to the lighting of the lamps. The Local Board offered £1 6s. per lamp, from sunset to midnight, which the Company could not accept. The Board have, therefore, resolved upon the introduction of oil lamps, and intend to try to light with 26 oil lamps the streets in which 72 gas lamps were formerly used.

Burnley Corporation Gas and Water Supply.—The annual accounts of the Corporation of Burnley, for the year ending June 30, have just been issued. Mr. Gill, the Borough Accountant, in his abstracts states that in the water-works department there was a profit of £1573 17s. 11d. the total figures showing £8099 2s. 9d. receipts, and £6525 4s. 10d. expenditure. The gas-works department was the most profitable, there being, notwithstanding a reduction in the price of gas to the extent of 6d. per 1000 feet made in January last, a surplus of £3679 16s. 1d., the receipts having amounted to £31,553 7s. 8d., whereas the expenditure has been £27,873 11s. 7d. The profits were £2366 12s. 1d. less than last year. The receipts for gas-rents, in consequence of the reduction in price, fell off £834 3s. 4d.; payments for general repairs account and wages were respectively increased £8611 2s. 4d. and £1151 4s. 5d.; and £492 4s. 6d. was written off for an accumulation of bad debts since 1860.

The Croydon Local Board Sewage Farm.—An arbitration was commenced on Monday, the 13th inst., at the Surveyors Institute, Great George Street, Westminster, before Mr. J. Clutton, between the Croydon Local Board and Messrs. J. Beddington and others, the object being to ascertain the price which should be paid for 176 acres of land in the vicinity of Croydon, now leased to the Board for sewage farm purposes. The Board have acquired the freehold of certain lands adjacent to the Bennington Estate, and in 1870 took a lease of the latter property for 21 years, at £10 per acre for the first ten years, and £12 per acre during the remaining 11 years. The necessities of Croydon now make it desirable that the Board should exercise the compulsory powers of purchase they have acquired since entering on the lease. As illustrating the growth of the town, the following figures have been cited in the case:—In 1851 the population was 20,355; in 1861, 30,229; 1875, 55,625; 1879, 69,000. Inhabited houses: 1851, 3444; 1861, 5286; 1871, 9866; 1879, 12,500. Rateable value: 1851, £62,126; 1861, £97,127; 1871, £264,917; 1879, £350,000. The price asked for the land is £300 per acre, the total being £52,800.

Bury and Radcliffe Water-Works.—Last Thursday, some of the members of the Bury Town Council visited the reservoirs of the late Bury and Radcliffe and the Haslingden and Rawtenstall Water-Works Companies, which the Corporation acquired in 1872. The reservoirs extend from Clowbridge, near Burnley, to Whitefield, and supply a district nearly 16 miles long. The last reservoir at Whitefield was tapped on the 4th of August. It is capable of holding 7,300,000 gallons. The following townships are supplied:—Higher Booths, Lower Booths, Newchurch, Haslingden, Musbury, Tollington-lower-End, Tollington-higher-End, Walmersley, Bury, Elton, Radcliffe, Pilkington, Prestwich, and Little Lever. There are about 100 miles of pipes laid in connection with the works, and the population supplied is about 110,000. The total area of the watershed is 3795 acres, and the capacity of the reservoir is equal to 638,000,000 gallons. They will supply at present 2,750,000 gallons per day, and there is a watershed not yet utilized which will supply 1,500,000 gallons per day, or 4,250,000 gallons in all; and this watershed will have to be taken to at an early date. This would give 20 gallons per head per day to a population of 212,000 persons.

Register of Patents.

1355.—Billing, C. E., Hatton Garden, London, "*Improvements in gas-burners and reflectors for heating and warming purposes.*" Patent dated April 5, 1878.

A stove constructed according to these improvements has a concave reflector plate, formed with projections pointing in every direction, the surfaces being raised to various heights on the plate, so as to break the lateral curvilineal radiating projections of the rays of heat and light. An improved atmospheric gas-burner is employed, consisting of a vertical tube with an inner rod extending its whole length, and having attached to its upper end an inverted cone placed a suitable distance above the top edge of the tube, the latter being perforated or entirely open at the bottom part for admitting and mixing atmospheric air and gas in the proper proportions for combustion.

1386.—Aitchison, A., and Taylor, R. N., Manchester, "*Improvements in apparatus and materials for producing gas for illuminating and heating purposes.*" Provisional protection only obtained. Dated April 8, 1878.

This invention relates to apparatus for domestic use, or for producing gas upon the premises in which it is to be used, and is particularly applicable for use on shipboard, or in dwelling-houses, works, or public buildings. The gas is generated from oil or oils, or hydrocarbons or liquid matters, by means of a retort, heated by a fire, adapted to be also used for other purposes—as, for example, the fire of a cooking stove or range.

1391.—Lake, W. R., Southampton Buildings, London, "*Improvements in apparatus for measuring water or other liquids.*" A communication. Patent dated April 8, 1878.

This invention consists in combining two eccentric gear wheels or "gears" of proper construction with a set of two co-acting pistons, each piston consisting of two or more radial blades or wings, provided at their outer ends with short segmental plates or faces, by means of which the pistons are compelled to move alternately with relatively different rates of speed, in order that there should always be contact between one of the peripheral wing plates of one piston and the hub of the other at all stages of their revolution, and that no water may be allowed to escape unmeasured. The two eccentric gear wheels must be made of corresponding shape to effect these objects—oval, where each piston consists of two radial wings; triangular, if of three wings; and quadrangular, if of four; and so on; but in practice the two-winged pistons and oval gears are preferred. The improvement in the cylinder or liquid measuring chamber consists in forming the internal surface, against which the peripheral surfaces of the pistons bear, with a series of recesses, leaving only a number of narrow ribs for the pistons to play against, instead of a continuous surface as heretofore. These ribs must be so arranged in each end of the cylinder that there shall always be contact next the induction opening between, at least, one of them in each end and one of the piston peripheral surfaces.

1504.—Wanklyn, J. A., and Cooper, W. R., Westminster, "*Improvements in the method of determining organic matters contained in solutions.*" Patent dated April 15, 1878.

This invention consists in effecting the measurement or determination of the organic matters in solution by employing a standard solution of permanganate of potash as the oxidizing agent, measuring the quantity of permanganate employed in the usual manner; but, instead of simply adding the permanganate to the acidified solution, the solution is rendered alkaline, and then boiled with a known volume of the permanganate, and thereby the organic matters are oxidized at a boiling heat. The liquid is then allowed to cool, is acidified, and by any of the ordinary processes is ascertained how much permanganate remains unconsumed. The difference between the quantity of the permanganate added originally to the solution before boiling, and that found afterwards, is the actual amount of permanganate consumed by the organic matters in solution.

1509.—Gedge, W. E., Wellington Street, Strand, "*An improved water-meter.*" A communication. Patent dated April 16, 1878.

The construction of this water-meter is only described by reference to the drawings accompanying the specification.

1511.—Waldron, E., London Road, Surrey, "*New or improved rotary pumps or engines, applicable for transmitting power, and for compressing or exhausting air or gas, and also applicable as a liquid or fluid meter.*" Patent dated April 16, 1878.

In carrying out this invention, as applied to a single engine or machine, there is a case or shell having covers at both ends. In the interior is a drum which is slotted for the reception of pistons or vanes. The drum has caps fitted to both ends, into which it is sunk a considerable distance. These caps are kept correctly and tightly attached to the drum by means of steady pins and screws, or equivalent device or other means. Inserted and secured into the caps are shafts, or the same may be cast with the drum, or the drum, drum-caps, and shafts may be cast in one piece. The caps are slotted for the reception of packing, and also for the reception of such portions of the pistons or vanes as may travel therein. On a line with each of the pistons or vanes in the drum and drum-caps, and close to the centre between the drum-caps, are holes bored through the drum; into each of which is fitted a cylindrical tube, solid or plugged in the centre. In each end of each of these tubes there are springs which project beyond the edges of the tubes. These springs bear on the pistons or vanes, and keep them in contact with the inner periphery of the case. Neither the drum nor the drum-caps touch any part of the case at any point in the revolution. Around the periphery of each drum-cap there is a metallic packing ring having arms extending inwards. These arms fit into the slots in the drum-caps, and the ends of them bear on portions of the periphery of the drum, and those portions of the arms which are nearest to the centre are the narrowest, with the object of proportioning the surface to be travelled under friction.

APPLICATIONS FOR LETTERS PATENT.

4219.—Davis, H. J., Camberwell, London, "Improvements in gas-stoves." Oct. 18, 1879.

4220.—Cutler, S., Millwall, London, "Improvements in gasholders." Oct. 18, 1879.

4222.—Joy, A. A., Chancery Lane, London, "Improvements in apparatus for regulating the flow of gas or other fluids." Oct. 18, 1879.

4225.—Ellis, G. H., Walbrook, London, and Light, C. L., Westminster, "Improvements in the manufacture of pipe joints." Oct. 18, 1879.

4229.—Engel, F. H. F., Hamburg, Germany, "Improvements in automatic apparatus for lighting and extinguishing gas-burners." A communication. Oct. 18, 1879.

4238.—Tasker, W. H., Blackpool, Lancs, "A new or improved apparatus to be applied to gas-pipes or gas-burners for cooking and heating purposes." Oct. 20, 1879.

4242.—Prunier, A., jun., Livron, France, "A new or improved water-regulator." Oct. 20, 1879.

4252.—Lake, W. R., Southampton Buildings, London, "Improvements in carburetting apparatus for the manufacture or enrichment of illuminating gas." A communication. Oct. 20, 1879.

4281.—Wilson, J. H., Islington, London, "An improved gas extinguisher." Oct. 22, 1879.

4290.—Smith, G., Shepherd's Bush Common, London, "Improvements in the apparatus for the manufacture of gas and machinery used for charging receptacles for the same, whether on railway carriages or elsewhere." Oct. 22, 1879.

4303.—Aron, A., Rose Street, London, "Improved apparatus for obtaining light." Oct. 22, 1879.

The GRAND MEDAL of MERIT at the VIENNA EXHIBITION, TWO MEDALS at the PHILADELPHIA EXHIBITION and TWO MEDALS at the PARIS EXHIBITION, have been AWARDED to GWYNNE & CO. for GAS-EXHAUSTERS, ENGINES, and PUMPS; Also 27 OTHER MEDALS AWARDED at all the GREAT INTERNATIONAL EXHIBITIONS.

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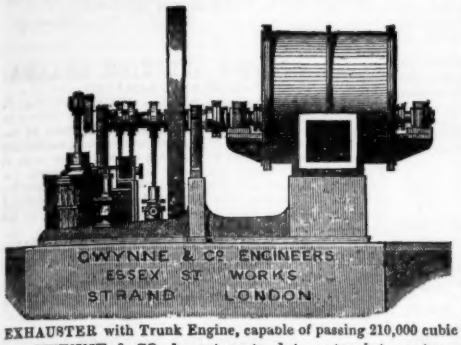
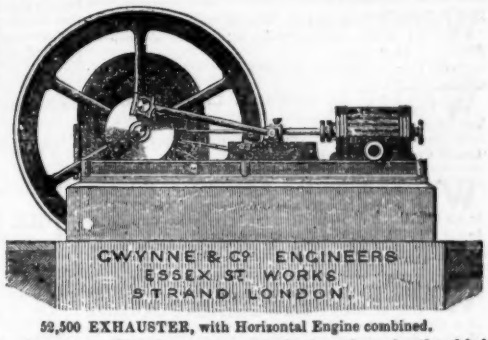


EXHAUSTER with Trunk Engine, capable of passing 210,000 cubic feet per hour.

The Judges report on the combined Exhauster and Steam-Engine exhibited at the Philadelphia Exhibition is—"*Reliable compact Machine, well adapted for the purpose intended, of excellent workmanship.*"

GWYNNE & CO. have made the largest and most perfect Gas-Exhausting Machinery in the world, and have completed Exhausters to the extent of 8,000,000 cubic feet passed per hour, of all sizes from 2000 to 210,000 cubic feet per hour.



52,500 EXHAUSTER, with Horizontal Engine combined.

GWYNNE & CO. do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, *but to produce machinery of the very highest quality, and most approved design and workmanship.* The result is that in every instance their work is giving the fullest satisfaction. Numerous testimonials and references can be given to Companies using their Machinery for years past.

Exhausters, with or without Engines combined, can be made to pass the gas WITHOUT OSCILLATION OR VARIATION IN PRESSURE Regulators, Bye-Passes, Stop-Valves, Gas-Valves, Station Governors, and Gas Machinery of all Sizes.

PLEASE ADDRESS IN FULL, GWYNNE & CO., Hydraulic and Gas Engineers, ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C., ENGLAND.

Gwynne & Co.'s New Catalogue on Gas-Exhausting and other Machinery may be obtained on application at the above Address.

BEALE'S IMPROVED PATENT GAS EXHAUSTERS,

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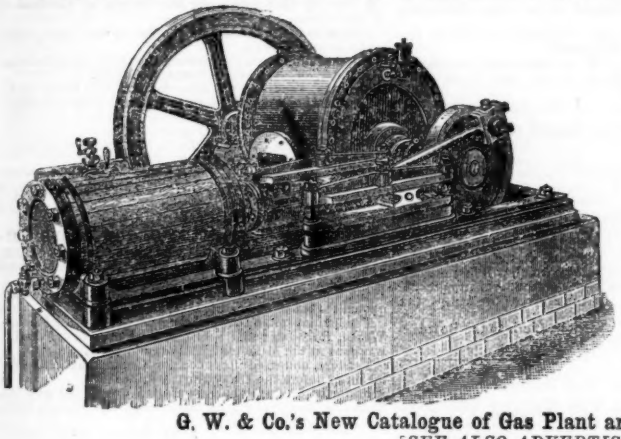

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MAKERS OF ENGINES, EXHAUSTERS, INDEX AND DISC GAS-VALVES, HYDRAULIC MAIN VALVES, BYE-PASS VALVES, TAR, LIQUOR, AND OTHER PUMPS, SCRUBBERS AND PURIFIERS, CONDENSERS, BOILERS, &c.

G. W. & Co.'s New Catalogue of Gas Plant and Machinery can be had on application.

[*SEE ALSO ADVERTISEMENT, PAGE* 686.]

Phœnix Engineering Works:

HOLLAND STREET, SOUTHWARK, S.E.

ECONOMY IN THE PRODUCTION OF GAS, AND CARBON DEPOSIT ENTIRELY PREVENTED.

PLUTONIC CEMENT,

FOR JOINTING AND REPAIRING RETORTS AND OVENS *in* ACTION AND *out* OF ACTION.

A Pamphlet on the advantages of the above, with Modes of Application, References, Prices, &c., free by post, from the Sole Manufacturer, WILLIAM RICHARDSON, Gas and Hydraulic Engineer, CHARLES HENRY STREET, and BISSELL STREET, BIRMINGHAM.

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SCIENCE & PRACTICE OF THE MANUFACTURE & DISTRIBUTION

OF

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VOL. I. contains 460 pages of Letterpress, and is illustrated by 521 Woodcuts and 36 page and double-page Engravings, printed on Plate paper, and a full-page COLOURED ENGRAVING of the BECKTON GAS-WORKS, forming a frontispiece to the Work.

VOL. II. contains 470 pages of Letterpress, and is illustrated by 355 Woodcuts and 28 page and double-page Engravings.

Price of each Volume, 28s.

ORDERS RECEIVED BY

WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.

WANTED, Readers of the NEW Edition, 1879, "Cooking & Heating by Gas;" on Burners, &c. Copies, by post, Threepence, direct from the Author, MAGNUS OHREN, Assoc.M.I.C.E., Gas-Works, SYDENHAM.

THE Manager of the Oxford Gas-Works begs to recommend a steady middle-aged man as Fitter, Main and Service Layer, or to take sole charge of a small Works.

WANTED, a good Steady Man as Gas-FITTER and MAIN-LAYER. One who can do Smith's work preferred.
Apply to J. H. PARSONS, Manager, Gas-Works, OSWESTRY.

WANTED to Lease, a medium-sized Gas-Works. Midland Counties preferred. Highest references given.
Apply, by letter, to No. 595, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by the Advertiser, the son of a Gas Manager, a Situation as ASSISTANT MANAGER. Fair Draughtsman. Five years experience in the Manufacture of Sulphate of Ammonia.
Address No. 597, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by the Advertiser, a Situa-tion as MANAGER or ASSISTANT MANAGER of a large Works. Has had every experience in a Gas-Works. Satisfactory reasons for wishing to change. Good references and testimonials.
Address No. 589, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Re-engagement as MANAGER or ASSISTANT MANAGER of a Gas-Works. Has had considerable experience in the Manufacture, Distribution, and Testing of Gas in all its branches.
Address G. L., care of Mr. Crisp, 7, Bermondsey Square, LONDON, S.E.

RADCLIFFE AND PILKINGTON GAS COMPANY.

THE Directors are in want of a Person competent to fill the office of MANAGER and SECRETARY to the Company. A statement of the duties, amount of salary, &c., may be had on application to Mr. Thomas Newbigging, C.E., 5, Norfolk Street, Manchester.
Applications, with testimonials as to character and ability, to be sent to THOMAS STATTER, Esq., Stand Hall, WHITEFIELD, Chairman of the Company, not later than Wednesday, the 29th inst.
Gas Offices, Radcliffe, Oct. 14, 1879.

CONGLETON CORPORATION GAS-WORKS.
(Make 20 millions.)

WANTED, a Manager for the above works, to superintend the practical working with full control; to keep the accounts with the assistance of a clerk; to conduct the correspondence, and to attend the Gas Committee's meetings.
Address, stating age, length and nature of experience, and salary expected, with a few practical testimonials, to the Town Clerk, Congleton, on or before the 5th day of November next.
Declined applications will be returned.
JOHN WILSON, Town Clerk.
Town Hall, Congleton, Oct. 15, 1879.

CONGLETON CORPORATION GAS-WORKS.

TO GASHOLDER MAKERS.

WANTED, Tenders for the Repair and complete Restoration of the damaged Gasholder at the above-named Works. Also an alternative Tender for a new Holder with Guide Frame, Guides, &c., complete.
Parties tendering will be required to furnish detailed specifications of the work tendered for.
Further particulars may be obtained from Mr. W. Blackshaw, Borough Surveyor, Town Hall, Congleton; and sealed tenders, endorsed "Tender for Gasholder," to be sent not later than the 1st of November next to
JOHN WILSON, Town Clerk.
Town Hall, Congleton, Oct. 22, 1879.

TO BE SOLD, Cheap, Three Telescopic GASHOLDERS, two 60 ft. diameter and 20 ft. deep each lift, and one 70 ft. in diameter and 20 ft. deep. Only been in use eight years. May now be seen at work at the Effingham Street Gas-Works, Sheffield.
For price, apply to THOMAS PIGGOTT AND CO., Spring Hill, BIRMINGHAM.

SIX POUNDS PER CENT. DEBENTURES FOR SALE.

TO be Sold at Par, £4000 of First Mort-gage Debentures, in sums of £100 and upwards, in the English Company of the Buenos Ayres Gas Company, Limited. The debentures have about eight years to run, and the coupons are paid in London with the utmost regularity.
Address No. 598, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS-WORKS for Sale—Six Ovens, Two Hydraulic and Ascension Pipes, 4-in. Mains to Condensers, Three Purifying Boxes, and Two Gasholders of 10,000 feet each.
Apply to WILLIAM ASTON, Princip Street Works, BIRMINGHAM.

TO INVENTORS AND PATENTEES.

MR. W. H. BENNETT, having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their invention may be secured for Six Months; or LETTERS PATENT, which are granted for Fourteen Years.
Patents completed, or proceeded with at any stage, thereby rendering it unnecessary for persons resident in the country to visit London.
Patents procured for Foreign Countries.
Information as to cost, &c., supplied gratuitously upon application to the Advertiser, 22, Great George Street, WESTMINSTER.

THE GASLIGHT AND COKE COMPANY.

SALE BY TENDER OF £100,000 ORDINARY "A" CONSOLIDATED STOCK.

IN pursuance of The Gaslight and Coke Company Act, 1876, notice is hereby given, that it is the intention of the Directors of this Company to SELL by TENDER £100,000 of NEW ORDINARY "A" CONSOLIDATED STOCK of the Company, to be paid up in full on or before the 1st of December next, such Stock being the second portion of additional capital authorized to be raised by resolutions passed at a General Meeting of Proprietors, held on Feb. 14, 1879, under the provisions of the above-mentioned Act.
Particulars and conditions of tender may be obtained on application at this Office, and sealed tenders must be sent in not later than Twelve o'clock (noon) on Friday, the 7th of November next.
By order,
JOHN ORWELL PHILLIPS, Secretary.
Chief Office, Horseferry Road, Westminster, S.W.,
October, 1879.

TO SULPHATE OF AMMONIA AND SULPHURIC ACID MAKERS.

THE Directors of The Gaslight and Coke Company require the services of a duly qualified person, to act as Manager of their Sulphate of Ammonia and Sulphuric Acid Works at Beckton, under the supervision of the Chief Engineer of the Station, from whom full particulars of the appointment can be obtained
The Manager must possess a knowledge of Chemistry, and be thoroughly acquainted with all the details of sulphate of ammonia manufacture, as well as the manufacture of sulphuric acid.
He will be required to reside at or near the works.
Applications, in writing, accompanied by testimonials, stating age and experience, together with salary required, should be addressed to me on or before Thursday, the 6th of November.
By order,
JOHN ORWELL PHILLIPS, Secretary.
Chief Office, Horseferry Road, Westminster, S.W.
Oct. 22, 1879.

THE Directors of the Exeter Gaslight and Coke Company are prepared to receive TENDERS for a Corrugated IRON ROOF for a Coal Store at their Basin Station.
Plans, specifications, and conditions of the same may be seen on application to the Engineer, at the Basin Gas-Works, and tenders, endorsed "Tender for Iron Roof," to be sent to me, the undersigned, on or before Thursday, Nov. 6, 1879.
The Directors do not bind themselves to accept the lowest or any tender. By order,
W. A. PADFIELD, Secretary.
Gaslight Offices, North Street, Exeter, Oct. 16, 1879.

OLDBURY LOCAL BOARD GAS-WORKS.

THE Oldbury Local Board are prepared to receive TENDERS for the Erection of a New GAS-WORKS, to supply their district with gas.
The drawings and specification may be seen on application to the Engineer, Mr. A. Upward, 8, Queen Anne's Gate, Westminster, on and after Wednesday, Sept. 10, 1879, and sealed tenders are to be delivered to me, the undersigned, on or before Monday, Nov. 3, 1879, addressed to the Chairman and Members of the Oldbury Local Board.
Forms of tender may be obtained at the Office of the Engineer on payment of one guinea, which will be returned on the receipt of a *bonâ fide* tender on the form supplied.
The Board do not bind themselves to accept the lowest or any tender.
A. WRIGHT, Solicitor, Clerk to the Board.
Board Room, Oldbury, Sept. 23, 1879.

TO CHEMICAL MANUFACTURERS, TAR DISTILLERS, AND OTHERS.

THE Directors of the Shipley Gaslight Company are prepared to receive TENDERS for the Purchase of their Surplus TAR and AMMONIACAL LIQUOR for One year from Jan. 1, 1880.
The Company will load f.o.b. the Leeds and Liverpool Canal, at Shipley, or into the Contractor's carts at the Works.
The quantity of Coal carbonized in Twelve months is about 8000 tons.
Any further information can be had on application to the Manager.
Sealed tenders (stating separately price per ton for Tar and Liquor and endorsed "Tender for Tar, &c.") to be sent in on or before Nov. 11, 1879.
JOHN WILCOCK, Manager.
Gas-Works, Shipley, Oct. 24, 1879.

LEICESTER CORPORATION WATER-WORKS.

CONTRACT NO. 3.

THE Water-Works Committee of the Corporation of Leicester are prepared to receive TENDERS for the Construction of two additional FILTER BEDS, and other works connected therewith, at their Bradgate pumping station near Cropston.
Drawings and specifications may be seen at the Water-Works Office at Leicester, and at the Office of Messrs. T. and C. Hawksley, Civil Engineers, 30, Great George Street, Westminster, S.W., on and after Monday, the 27th of October inst., where copies of the bills of quantities may be obtained on payment of one guinea, which sum will be returned if a *bona fide* tender be made.
Tenders, duly sealed and endorsed "Tender for Filter Beds, &c." must be delivered at my Office on or before Ten o'clock in the forenoon of Monday, the 17th of November next.
The Committee do not undertake to accept the lowest or other tender.
JOHN STOREY, Town Clerk.
Town Hall, Leicester, Oct. 21, 1879.

GAS LIGHTING IMPROVEMENTS.

GEO. BRAY & CO.'S NEW PATENT LANTERNS.

See Page 682.

BAHIA GAS COMPANY, LIMITED.
NOTICE is hereby given that the ORDINARY HALF-YEARLY GENERAL MEETING of this Company will be held at the Company's Office, St. Dunstan's House, Cross Lane, London, on THURSDAY, the 6th day of November, 1879, to receive the Report of the Directors, the Balance-Sheet confirmed by the Auditors, and for general purposes.
The chair will be taken at Three o'clock precisely.
By order of the Board,
ALFRED J. HEAD, Secretary.
Oct. 25, 1879.

GEORGETOWN (BRITISH GUIANA) GAS COMPANY, LIMITED.
NOTICE is hereby given that the ORDINARY HALF-YEARLY GENERAL MEETING of the SHAREHOLDERS of the above Company will be held at the Offices of the Company, 30, Gracechurch Street, in the City of London, on TUESDAY, the 18th of November next, at Three o'clock in the afternoon precisely, to receive the Directors Report and the Accounts of the Company for the half year ending the 30th of June last, to declare a Dividend, and to transact the General Business of the Company.
The Transfer Books will be closed from the 5th to the 18th of November next, both inclusive.
By order of the Board,
ALFRED LASS, Secretary.
Offices, 30, Gracechurch Street, London,
Oct. 21, 1879.

TO GASHOLDER BUILDERS.

TENDERS are required by the South Metropolitan Gas Company for a Three-Lift TELESCOPIC GASHOLDER, 214 ft. diameter and 53 ft. 6 in. deep, the total height, when full, to be nearly 160 feet, and the contents over 5 million feet.
Specifications and plans may be seen on application at the works, 589, Old Kent Road, S.E.
Tenders to be sent in on or before the morning of Monday, Nov. 10 next.
The Directors do not bind themselves to accept the lowest or any tender.
By order,
GEORGE LIVESEY, Secretary and Engineer.
Oct. 17, 1879.

ROCHDALE CORPORATION.

THE Gas Committee of the Corporation invite TENDERS for the Supply of 150 Tons of Oxide of Iron.
They also invite tenders for the Sale of the Spent Oxide made at such Works.
Further information respecting the above can be had from Mr. Paterson, at the Gas-Works, Rochdale.
Tenders, endorsed "Tender for Oxide of Iron," or for "Spent Oxide," must be sent to me on or before the 4th of November next.
By order,
ZACH. MELLOR, Town Clerk.
Town Hall, Rochdale, Oct. 24, 1879.

ROCHDALE CORPORATION.

TENDERS FOR COAL.

THE Gas Committee of the above Cor-poration invite TENDERS for the Supply of 20,000 to 40,000 tons of coal—20,000 tons (to be delivered in equal monthly quantities) between April 1, 1880, and April 1, 1881; and the remaining 20,000 tons to be delivered in like quantities between April 1, 1881, and April 1, 1882.
Tenders must state the price per ton delivered at the Gas-Works, Rochdale; and also the price per ton delivered in waggons at the Milkstone Railway Siding, Rochdale.
Tenders, endorsed "Tender for Coal," must be sent to me on or before the 4th of November next.
Forms of tender and all particulars can be had from Mr. Paterson, Manager at the Corporation Gas-Works, Rochdale.
ZACH. MELLOR, Town-Clerk.
Town Hall, Rochdale, Oct. 24, 1879.

MANCHESTER CORPORATION CONSOLIDATED STOCK.

THE Corporation of Manchester are prepared to receive TENDERS for an issue of this STOCK to an extent of £250,000.
The Manchester Corporation Consolidated Stock is by Act of Parliament (35 and 36 Vict., cap. 31) made a "charge upon the City Rate, and all landed and other property vested in or belonging to the Corporation, or which may be acquired by them."
The City Rate is not limited in amount, and the security for this Stock is, therefore, not only the whole of the property vested in or belonging to the Corporation, including the Gas and Water-Works properties, but in fact the whole of the property within the City of Manchester, the rateable annual value of which now exceeds 2½ millions sterling.
Sealed tenders, addressed to "The Consolidated Stock Sub-Committee, Town Hall, Manchester," and endorsed "Tender for Stock," for sums divisible by ten, but not being in any case less than £50, must be delivered on or before four o'clock p.m. on Wednesday, the 5th of November next, and must state the amount required, and the premium which will be given. The Stock will be issued free of all charges and expenses, and will carry interest, payable half yearly, at the rate of 4 per cent. per annum.
Interest on the total amount of the Stock (calculated from the date or dates of payment) will be payable on June 24, 1880.
The Finance Committee have decided to fix the minimum price of the new issue at £104 10s. on every £100 of stock, below which no tender will be accepted.
Payment will be required to be made to the City Treasurer as follows:—One half of the allotment on the 19th of November, and the other half on the 5th of December next. Persons whose tenders are accepted can, if they so desire, pay the whole amount in full on the first-named or any subsequent date up to the 5th of December, and interest at 4 per cent. will be allowed.
In the event of the receipt of tenders for a larger amount of Stock than that proposed to be issued at or above the minimum price, the tenders at the lowest price accepted will be subject to a *pro rata* diminution.
Printed forms of tender can be obtained at the Office of the Registrar of Stock, at the Town Hall, but no specific form is absolutely required.
By order,
JOS. HERON, Town Clerk.
Town Hall, Manchester, Oct. 17, 1879.

BANGOR LOCAL BOARD.

THE Bangor Local Board are prepared to receive TENDERS for the Erection, at their Gas-Works at Bangor, of Four Dry Lime PURIFIERS, with connections; a Wrought-Iron Slated ROOF, for covering purifier-house; also a quantity of 6-in. Cast-Iron SOCKET PIPES.

The drawings and specification may be seen on application to the Engineer, Mr. A. Upward, 8, Queen Anne's Gate, Westminster, or to the Manager, Water and Gas Office, Bangor, Carnarvonshire, on and after Wednesday, Oct. 22, 1879.

Sealed tenders are to be addressed to the Chairman and Members of the Gas Committee of the Local Board, Bangor, endorsed "Tender for Purifiers, &c.," under cover to Mr. A. Upward, as above, on or before Monday, Nov. 3, 1879.

A form of tender may be obtained at the Office of the Engineer on payment of one guinea, which will be returned on receipt of a *bona fide* tender on the form supplied.

The Board do not bind themselves to accept the lowest or any tender.

By order,
D. WHITE, Manager.

Board Room, Bangor, Oct. 16, 1879.

THE Gloucester Gas Company, ceasing to manufacture gas at their old works, will have the undermentioned APPARATUS for Sale about the beginning of August, viz.:—

110 Mouthpieces, D-shape, 13 in. by 22 in., with Wrought-Iron Lids, Cross-Bars, Stand, Bridge, and Dip Pipes. Also about 150 feet of D-shape Wrought-Iron Hydraulic Main, size 19 in. by 19 in. 28 Mouthpieces, D-shape, 16 in. by 20 in., with Wrought-Iron Lids, Cross-Bars, Stand, Bridge, and Dip Pipes. Also about 38 ft. of D-shaped Wrought-Iron Hydraulic Main, size 20 in. by 20 in. Annular Condenser, consisting of six Vertical Pipes, 24 in. diameter, 19 ft. high, with three 12 in. Slide-Valves and 12 in. Connections.

Scrubber (round), 5 ft. by 20 ft., with three 12-in. Slide-Valves, and 12 in. Connections.

Exhauster (Jones) to pass about 15,000 feet per hour.

Exhauster (Beales) to pass about 25,000 feet per hour.

Two Vertical Steam-Engines, each about 6-horse power, with Pulleys, and Shafting used for driving the above.

Boiler 14 ft. 6 in. by 3 ft. 6 in., with Centre Tube, and four Galloway Patent Tubes.

4-horse power Horizontal Steam-Engine.

Three 4-in. Pumps, with cranked Shafting and a pair Mitre Wheels.

Set of four Purifiers, 12 ft. by 12 ft. by 4 ft., with 12-in. Centre-Valve (Cockeys), and Connections and Lift complete.

Station-Meter by A. Wright and Co., London, with three 12-in. Slide-Valves, and 12-in. Bye-Pass and Connections, to pass about 25,000 feet per hour.

Gasholder, Double Lift, with Cast-Iron Tank, capacity 37,000 feet.

Gasholder, Double Lift, capacity 100,000 feet.

Gasholder, Double Lift, capacity 240,000 feet.

Two 12-in. Governors, by Wright, London, with 12-in Valves, Bye-Pass, and Connections.

Two 12-in. four-way faced Valves, by Cockey.

For further information, &c., apply to the undersigned.

R. MORLAND, Engineer.

THE

IMPERIAL METER CO.,

LIMITED,

(Formerly Walter Ford, at Gray's Inn Road,)

KING'S ROAD, ST. PANCRAS,

Manufacturers of THE IMPROVED DRY GAS-METER, THE PATENT WET GAS-METER, Special Meters for Public Lighting, STATION-METERS, Governors, &c.

PRICE'S PATENT COKE & COAL BARROW

effecting a great saving of time, labour, and expense.

For particulars, price, &c., apply to Mr. E. PRICE, Inventor and Patentee, Gas-Works, Hampton Wick, MIDDLESEX.

Prices are Reduced.

BELGIAN CLAY RETORTS.

J. SUGG and CO., late ALBERT KELLER, GHENT.—The removal of the import duties on Earthenware permitting the entry of Clay Retorts into England, Messrs. Sugg, of Ghent, beg to draw the attention of the Gas Companies of London, and other Cities, to the very superior quality of the RETORTS manufactured by them. They can be made of any size, in one piece, and of any form. The price will be in proportion to the weight, and very moderate in comparison to their value.

Communications addressed to J. SUGG & Co., GHENT, will receive immediate attention.

GAS COAL.

THE Tawd Vale Colliery Company, Limited, are prepared to Contract for the Supply of their superior Arley and other GAS COALS, and to send samples to the order of Gas Engineers and others, or complete analysis on application. Shipped at Liverpool, Preston, Fleetwood, Garston, or Birkenhead.

Mr. James Paterson, C.E., F.G.S., in his analysis of T. V. Arley Coal, says: "Some parts merge into a semi-Cannel; Gas per ton, 10,300 cubic feet; illuminating power, 16·96 candles; coke of high quality, 1431 lbs. per ton."

Collieries, Skelmersdale, near Ormskirk; Offices, 5, New Hall, Old Hall Street, LIVERPOOL.

CROTTER, HAINES, & CORBETT,

BRETTELL'S ESTATE

FIRE CLAY & BRICK WORKS,

STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASS-HOUSE FURNACE & BLAST-FURNACE BRICKS LUMPS, TILES, and every description of FIRE-BRICK.

Proprietors of

BEST GLASS-HOUSE POT and CRUCIBLE CLAYS.

SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

ASBESTOS,

INDESTRUCTIBLE FUEL FOR GAS-FIRES.

REDUCTION IN PRICES.

Apply for Price List and Samples to the Original Manufacturer,

THOS. REYNOLDS,

100, ASTON ROAD, BIRMINGHAM.

SCOTCH CANNEL COALS.

The Subscriber is prepared to contract for the supply of all the principal SCOTCH CANNEL COALS. Prices and Analyses of the various Coals will be forwarded on application.

JAMES M'KELVIE,

CANNEL COAL MERCHANT,

HAYMARKET, EDINBURGH.

Established 1846.

CLOTH GAS-BAGS FOR MAINS,

As supplied to the Imperial, Chartered, and other London and Provincial Gas Companies. Bellows and Valves for inflating Well Dresses, Stokers Gloves, India-Rubber Suction and Delivery Hose, Gas-Tubing, Leather, India-Rubber, and Gutta-Percha Machine-Bands, Sheet and Washers, and Steam Joints.

T. BUGDEN, Manufacturer,

107, GOSWELL ROAD, LONDON, E.C.

JAMES NEWTON & SONS,

(Established 1820,)

FIRE-BRICK AND TILE MERCHANTS,

Wholesale and for Exportation,

FALCON DOCK, 78 AND 79, BANKSIDE,

SOUTHWARK, LONDON, S.E.,

DEPÔT for STOURBRIDGE AND NEWCASTLE FIRE-BRICKS, LUMPS, TILES, and FIRE-CLAY, and every Article suitable for

GAS AND WATER WORKS.

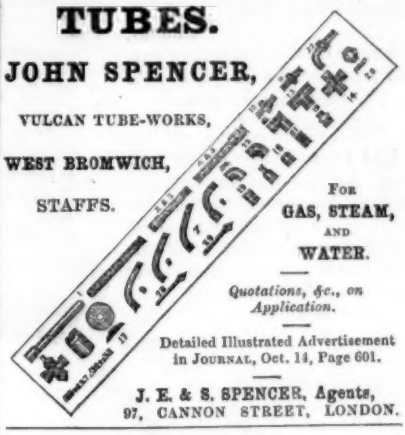
TUBES.

JOHN SPENCER,

VULCAN TUBE-WORKS,

WEST BROMWICH,

STAFFS.



FOR

GAS, STEAM,

AND

WATER.

Quotations, &c., on Application.

Detailed Illustrated Advertisement in JOURNAL, Oct. 14, Page 601.

J. E. & S. SPENCER, Agents,

97, CANNON STREET, LONDON.

Now ready, Second Edition, price 7s., by post 7s. 3d., the

GAS MANAGER'S HANDBOOK.

By THOMAS NEWBIGGING, M.I.C.E.

Orders to be sent to

WALTER KING,

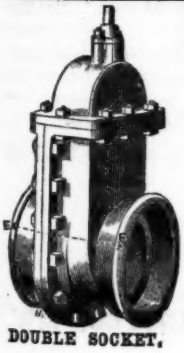
11, BOLT COURT, FLEET STREET, LONDON, E.C.

JOHN HALL AND CO., STOURBRIDGE,

Manufacturers of FIRE-BRICKS, LUMPS, TILES,

AND EVERY DESCRIPTION OF FIRE-CLAY GOODS.

N.B.—A Stock of 15 and 16 in. CIRCULAR RETORTS always on hand. Other kinds made to order on short Notice.



DOUBLE SOCKET.

IMPROVED SCREW-VALVES,

For Water, Tar, Ammoniacal Liquor, &c.

MADE EITHER WITH FLANGED OR SOCKET ENDS.

B. DONKIN & Co.

BERMONDSEY, LONDON, S.E.

Now ready, price 6d. and 1s.

THE

SOFTENING AND PURIFICATION OF WATER

ON AN IMPROVED SYSTEM.

PART I. explains the application of the system to large or small supplies for Private Mansions, Schools, Colleges, Asylums, Hospitals, Public Institutions, &c. Price 6d.

PART II. treats of the application of the system to large supplies for Water-Works and for Manufacturing Purposes, Paper Mills, Breweries, Bleach Works, the Prevention of Incrustation in Steam Boilers, stationary or locomotive, &c. It also contains extracts from Tables of Analyses, and Notes on Water Supply, specially useful for reference in connection with the question of Water Softening and Purification. Price 1s.

F. H. ATKINS & CO., ENGINEERS,

62, FLEET STREET, LONDON, E.C.

JOHN ROMANS, C.E., F.G.S.E.,

CONSULTING GAS ENGINEER

AND

CANNEL COAL FACTOR,

30, St. Andrew Square, EDINBURGH.

Plans and Estimates furnished; Gas-Works, Apparatus, Pipes, Machinery, Fire Goods, &c., supplied, or Attested and Shipped for Exportation.

GAS-WORKS TAKEN ON LEASE.

MR. ROMANS has for upwards of 30 years been practically engaged in the Manufacture of Gas, and has, by extensive experiments, ascertained that by JUDICIOUS INTERMIXTURE of the lighter with the heavier gases, much of the rich Hydrocarbons CAN BE SAVED, which otherwise ARE LOST, during the process of manufacture. He is therefore enabled to give advice to those who favour him with their orders for Cannel, as to the class which will secure for their standard of illuminating power the HIGHEST ADVANTAGEOUS RESULTS.

ANALYSIS AND PRICES FORWARDED ON APPLICATION.

NOTICE.—Notwithstanding a number of statements which have been repeated in the public journals, that burners by other makers have surpassed these results, the reports of comparative experiments from which the subjoined extracts have been copied conclusively prove that the **"Sugg" Burners give over 30 per cent. of Illuminating Power more than can be obtained from any other burners with the like quantity of gas.**

WILLIAM SUGG'S IMPROVED SYSTEM OF STREET LIGHTING.

Results obtained from WILLIAM SUGG'S large Argands for Street Lighting, by Mr. William King, Engineer to the Liverpool United Gas Company:—

ARGAND BURNER, WITH TWO CONCENTRIC FLAMES.
Consumption per hour. 22·2 ft.
Illuminating power . 103·7 candles,
Or 4·67 candles per foot of gas.
ARGAND BURNER, WITH THREE CONCENTRIC FLAMES.
Consumption per hour. 40·8 ft.
Illuminating power . 208·8 candles,
Or 5·12 candles per foot of gas.
22·7-candle Gas was used in the above Experiments.

"The light exhibited last night (SUGG's 200-candle burner and lantern) was equal to 360 candles—more than double that given by the old lamps, while the consumption of gas was exactly the same—40 feet per hour." — *Glasgow Herald*, April 25, 1879.

"For all practical purposes no greater illumination than is hereby supplied could be desired." — *Vide Daily News*, Jan. 13, 1879.

NEW (REGISTERED) GLOBE PATTERN LANTERN, For London Argand Burners of 30, 50, 100, 200, and 400-Candle Power.

This lantern is glazed with opal reflecting panes and clear glass, as shown, thus securing an entire absence of shadow, and is fitted with the new self-ventilating top (registered), ensuring perfect steadiness of flame, even in the heaviest gale of wind.

Results obtained in Illuminating Power from WILLIAM SUGG'S 200-candle Burners with Cannel and Common Gas:—

Variety of Gas.	Cubic Feet of Gas burned per Hour.	Illuminating Power in Sperm Candles burning 120 Grains per Hour.	Number of Candles to which every Cubic Foot of Gas burned is equivalent.
Common 16-candle	53·4	228	4·25
Cannel 19-candle	47·3	252	4·76

Joint experiment by—

CHARLES HEISCH, F.C.S., Superintending Gas Examiner to the Corporation of London, late Professor of Chemistry at the Middlesex Hospital.

T. N. KIRKHAM, M.I.C.E., F.C.S.

C. MEYMOTT TIDY, M.A., M.B., Professor of Chemistry and of Forensic Medicine at the London Hospital, Medical Officer of Health for Islington, and late Deputy Medical Officer of Health for the City of London.

Mr. J. R. FRITH, Engineer of the Runcorn Gas-Works, Experimenting with a Sugg's Argand with three concentric rings, obtained an illuminating power of 220·5 candles, with a consumption of 45 cubic feet of 21-candle gas, or 4·9 candles per foot.

"SUGG's 200-candle burner, with 42·09 feet of 20·85-candle gas, gave an illuminating power of 231·56 candles."—*Report of Mr. A. C. M'Minn, Engineer to The Gaslight and Coke Company, Kensal Green Station.*

"The real modern Aladdin's magician is Mr. Sugg, who, by means of his improved burner, gives us 'new lamps for old ones.' See the Waterloo Road & Waterloo Place *passim*. '*Osi sic omnia!*' If all gaslight were like these, who would ask for Edison and electricity?"—*Vide Punch*, Feb. 15, 1879.

"The perfection of street gas lighting."—*Vide Times*, Feb. 1, 1879.

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LONDONDERRY GAS COALS

DIRECT FROM THE

MARQUESS OF LONDONDERRY'S COLLIERIES.

COUNTY OF DURHAM.

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LONDONDERRY OFFICES, SEAHAM HARBOUR, COUNTY OF DURHAM.

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FOR THE ERECTION AND REBUILDING OF GAS AND WATER WORKS,

RETORT-SETTING—A SPÉCIALITÉ.

ROBUS'S IMPROVED RETORT-SETTINGS, guaranteed to Carbonize a large amount of Coal with a small per cent. of Fuel.

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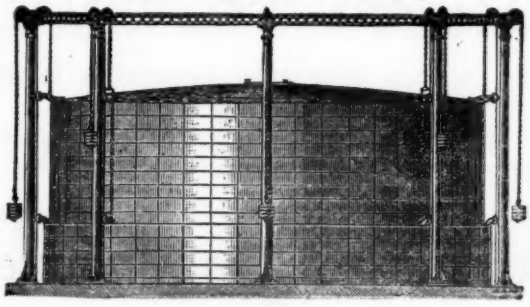
N.B.—All kinds of Fire Goods and Gas Apparatus supplied on the shortest notice.

Address:—J. & H. ROBUS, BELL GREEN, CATFORD, LONDON, S.E.



J. T. B. PORTER & CO.,

GAS ENGINEERS & MANUFACTURERS,

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GOWTS BRIDGE WORKS,

LINCOLN.

LONDON OFFICES: 1, WESTMINSTER CHAMBERS, S.W.

ESTIMATES FOR GAS-WORKS OF ANY SIZE.

REFERENCES TO 500 WORKS ALREADY ERECTED.

N.B.—All Communications to be addressed to the FIRM ONLY.

WANTED, by Samuel Thompson & Co., Colliery Office, Lancaster, APPLICATION for PRICES from Gas Managers who are prepared to receive Tenders for GAS COAL or CANNEL.

John Leigh, Esq., M.R.C.S., F.C.S., &c., &c., in his analytical report of S. T. & Co.'s Coal, says: "It is remarkable for its purity, I have scarcely ever examined a Coal containing so small a quantity of ash, and when Cannel of the best description is scarce, it may well replace this material."

TORBAY AND DART PAINT COMPANY, LIMITED.

WORKS:

DARTMOUTH & BRIXHAM (TORBAY) DEVON.

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SOLE PROPRIETORS AND MANUFACTURERS OF

WOLSTON'S CELEBRATED

TORBAY IRON PAINTS.

TRADE MARK

These Paints have been for many years extensively used in Her Majesty's Royal Dockyards, Woolwich Arsenal, the Shornoliffe and Curragh Camps, War Departments, and Colonies, and are largely supplied to Railway, Harbour, and GAS COMPANIES, Shipowners, Engineering Establishments, Railway Carriage and Wagon Works, and the Paint Trade generally. They are the BEST PROTECTORS of WOOD, CEMENT, and IRONWORK, even arresting corrosion after it has set in; and their base being oxide of iron, they are free from those properties which make lead paints so destructive to iron. They do not scale or blister, are not affected by great heat, and are the only Paints which will resist the effects of sulphuretted hydrogen. Their DURABILITY and covering properties have borne the test of A QUARTER OF A CENTURY'S PRACTICAL TRIAL.

The undermentioned colours—ground in best linseed oil, and requiring only to be thinned down for use in the ordinary way—are kept in stock:—

Torbay Brown.	Torbay Red.
Dart Green.	Slate.
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Brixham Black.	Torbay Chocolate.
Light Blue.	Cream Colour.
Dart Brown.	Dart Umber.
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Bronze Green.	Salmon Colour.
Navy Green.	Lead Colour.
Carriage Red.	Dark Stone.
Light Lead.	Crystal Palace Blue.
Light Green.	Iron Grey.

All other Colours made to order.

READY-MIXED PAINTS.

A great variety of Colours ready mixed for the brush are also always kept in Stock, in 3 lb., 7 lb., 14 lb., and 28 lb. cans.

Prices and Testimonials on application.

THE WIGAN COAL & IRON COMPANY,

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DISTRICT OFFICE: 97, NEW STREET, BIRMINGHAM; AGENT: W. M'GOWAN,

Supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, &c.

N.B.—The Wigan Coal and Iron Company, Limited, are exclusive owners of the well-known HAIGH HALL AND KIRKLESS HALL GAS COAL COLLIERIES.

LIVESEY'S PATENT WASHER.

This apparatus effects the most intimate contact between the liquor with which it is supplied and the gas passing through it, resulting in the complete removal of all particles of tar, increasing the ammonia strength of the scrubber and condenser liquor, and removing a large proportion of other impurities—notably, carbonic acid. The Washer is intended to work in conjunction with a scrubber. It occupies little space, and is inexpensive. It has been in successful constant use for nearly three years, does not become clogged with tar or corroded by the action of the liquor or gases, it gives three inches of pressure, and only needs a supply of liquor to keep it in regular action without any further attention.

For Particulars and Prices apply to

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Messrs. WILLEY AND CO., Commercial Road, EXETER, for West of England and South Wales;

Or to the PATENTEE, 589, OLD KENT ROAD, LONDON, S.E.

CAUTION.

The "Journal of Gas Lighting," of the 21st of October, having advertised for Sale

£4000 of First Mortgage Debentures in the English Company of the Buenos Ayres Gas Company, Limited,

Notice is hereby given that Holders of the Debentures referred to will have no resort to the assets of the Buenos Ayres Gas Company represented by

LOUIS WILDE,

42, SOUTH JOHN STREET,

LIVERPOOL.

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MANUFACTURERS OF

WET AND DRY GAS-METERS,

STATION-METERS, GOVERNORS,

PRESSURE AND EXHAUST REGISTERS,

LAMP-METERS IN CAST-IRON BOXES,

And every Description of Gas Apparatus.

JAMES MILNE & SON,

GAS ENGINEERS,

Gas-Meter, Gas Apparatus, and Gas-Fittings Manufacturers,

EDINBURGH, AND

2, KING EDWARD STREET,

NEWGATE STREET, LONDON.

Meter Works in London—2, CROSS STREET, WILDERNESS ROW, E.C.

STATION-METERS GOVERNORS, CONSUMERS METERS, GAS LUSTRES, CHANDELIERS, BRACKETS, &c.,

And every description of Gas-Fittings and Gas Apparatus.

THE "ACME"

REGULATOR.

Sample Boxes containing 1 doz., price 24s.

These Regulators are made in various forms, adjusted to pass from One-half to Sixty cubic feet per hour.

Also made to suit Consumers requirements, price 18s. per doz.

Sole Manufacturers,

THE

LONDON GAS BURNER CO.

Temporary Offices: 29, DUNDAS ROAD, PECKHAM, S.E.

AGENTS:

J. EDMUNDSON & CO., GAS ENGINEERS,

33 to 36, CAPEL STREET, DUBLIN.

C. & W. WALKER'S

WOOD PURIFIER SIEVES,

Which have now been used for fifteen years, and their advantages and durability fully established. They are made entirely by steam machinery in very large quantities at the most moderate cost.

MIDLAND IRON-WORKS,

DONNINGTON, NEAR NEWPORT, SHROPSHIRE.

FINSBURY CIRCUS, LONDON.

THOMAS CARR & SON,

MANUFACTURERS OF

FIRE-BRICKS, LUMPS, TILES, RETORTS, &c.,

COTSWOOD FIRE-BRICK WORKS, SCOTSWOOD-ON-TYNE.

Also Makers of all kinds of Common Building Bricks, and of Pressed White and Red Bricks for Facing.

ESTABLISHED IN 1860.

BENJAMIN CARPENTER,

THE ORIGINAL MANUFACTURER OF THE IMPROVED

WOOD SIEVES

FOR

GAS PURIFIERS & SCRUBBERS.

PROVIDENCE WORKS,

22, HERMES STREET, PENTONVILLE ROAD,

LONDON, N.

The Dunston Engine Works Co.,

GATESHEAD-UPON-TYNE.

Are the Sole Manufacturers of

Archer's Patent Hoists,

ALSO OF

Archer's Patent Stone Breaker,

AND OF

Archer's Patent Ore Crusher & Pulveriser,

The last-named Machine (without the Pulveriser) makes the best and most durable Coke Breaker.

JAMES OAKES & CO.,

ALFRETON IRON-WORKS, DERBYSHIRE,

AND

WENLOCK IRON WHARF, 21 & 22, WHARF ROAD, CITY ROAD, LONDON, N.,

Manufacture and keep in stock at their works (also a large stock in London) PIPES and CONNECTIONS 1½ to 48 inches in diameter; and make to order Retorts, Purifiers, and Tanks, with or without planed joints, Columns, Girders, Special Castings, required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Syphons and Covers are joint-faced if required, doing away with millboard and iron boring, or Syphons made without Covers, a socket being cast on and fitted with a small plug about 6 inches in diameter with lead joint. In either way preventing leakage.

GRIRDROD'S PATENT

PORTABLE PIPE SCREWING MACHINE,

For 1 in., 1¼ in., 1½ in., and 2 in. Gas Threads, complete £7 10s.

In use at the chief gas-works, and giving great satisfaction.

For other useful goods, see Bailey's "Illustrated Inventions," post free 3s. 6d.; gratis to ledger customers.

W. H. BAILEY & CO.,

Brassfounders, Gauge Injector and Tool Makers,

ALBION WORKS, SALFORD,

LANCASHIRE.

Gold Medal Awarded, Paris Exhibition, 1878.

THOMAS TURTON AND SONS,

SHEAF AND SPRING WORKS,

SHEFFIELD,

MANUFACTURERS OF

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FOR ENGINEERS,

STEEL OF ALL DESCRIPTIONS,

SCREW STOCKS, TAPS, AND DIES, SPANNERS, RATCHET BRACES, LIFTING-JACKS, ANVILS, VICES, AND ENGINEERS TOOLS GENERALLY.

LONDON OFFICE:

90, CANNON STREET, E.C.

STREET-LIGHTING IMPROVEMENTS.

BRAY'S

PATENT LANTERNS & FLAT-FLAME BURNERS

Of 30 to 200 CANDLES POWER.

This Apparatus has the following merits, viz.:—

The Burners are of the Flat-Flame type, which is the only practicable type for Street-Lighting purposes.

Their lighting power is greatly in excess of Flat-Flame Burners of any other make, and the up and the down light being taken into account it is in excess of that yielded by any Burners, Flat-Flame or otherwise.

The flame in the lantern is remarkable for its steadiness, whiteness, and brilliancy.

The lantern is storm proof, its efficiency not being materially affected in a gale of wind.

It is practically shadowless, though the top light is allowed to pass freely to the upper parts of buildings, instead of being reflected, in the main, round the base of the lamp, as in some systems.

These Lamps were first exhibited in connection with the Leeds Gas Exhibition, in front of the Town Hall, in conjunction with all the improved systems of Street Lighting now before the public, when the opinions expressed by Gas Engineers and the Public were that this apparatus yielded more light and diffused it better than the other systems there tried. Since this Exhibition they have been improved in several important features, the principal of these being an arrangement whereby the flame is kept in a state of efficiency in the stormiest weather.

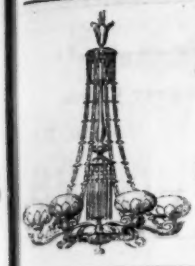
So long as we could see any desirable improvement to be effected, we have avoided, as far as possible, sending out our lanterns, or making any public announcement regarding them. We now feel convinced that our apparatus is nearer perfection than any in the market, and offer it with complete confidence.

Price and Particulars on application to

GEO. BRAY & CO.,

LAMP AND "ENAMEL" BURNER MANUFACTURERS,

LEEDS.



F. & C. OSLER,

45, OXFORD STREET, LONDON, W.

MANUFACTORY AND SHOW-ROOMS:

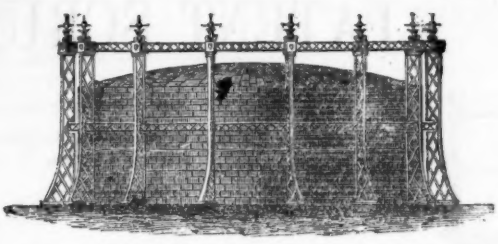
BROAD STREET, BIRMINGHAM.

ESTABLISHED 1807.

MANUFACTURERS OF CRYSTAL GLASS CHANDELIERS, WALL LIGHTS, AND LUSTRES FOR GAS AND CANDLES,

TABLE GLASS OF ALL KINDS,

CHANDELIERS IN BRONZE AND ORMOLU. MODERATOR LAMPS.



THE HORSELEY COMPANY.

LIMITED,

TIPTON, STAFFORDSHIRE.

LONDON OFFICE:

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GAS ENGINEERS, IRONFOUNDERS, &c.,

MANUFACTURERS OF

GASHOLDERS, WROUGHT AND CAST IRON TANKS, CONDENSERS, PURIFIERS, SCRUBBERS, MAINS, RETORT-LIDS, PLAIN AND DISHED, LAMP-POSTS, PIPES,

AND ALL REQUISITES FOR EITHER

GAS OR WATER WORKS;

ALSO

MAKERS OF ROOFS, BRIDGES, &c.

S. OWENS & CO.,

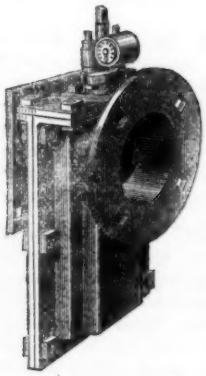
HYDRAULIC, GAS, AND GENERAL ENGINEERS,

WHITEFRIARS STREET, LONDON, E.C.

Sole Manufacturers of MANN & OWENS'

PATENT SCREW & CAM GAS-VALVE,

Protected by Royal Letters Patent in England, France, Belgium, & the United States of America.



BRIDGE-VALVE
for Regulating the Seal of Hydraulic Mains.

VALVE to OPEN DOWNWARDS. VALVE to OPEN UPWARDS,

The SPECIAL ADVANTAGES of MANN AND OWENS' PATENT VALVE are as follows:—

1. Its non-liability to become set fast through varying temperature or from the deposit from rude gas. 2. It is made absolutely gas-tight by the simple action of a screw and cam. 3. Inconvenience through the breakage of springs or wedges setting fast cannot arise. 4. The face of the Valve is scraped and cleaned of any solid matter at each operation of opening or closing.

The Valve can be had to work either in a Vertical or Horizontal position.

Every Valve is carefully tested under pressure, and warranted perfectly sound and gas-tight.

INSTRUCTIONS FOR ORDERING.

State whether required for above or below ground, if Double Flange or Socket and Spigot Valves are wanted, or with loose Flanged Socket and Spigot pieces.

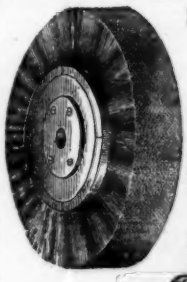
The Prices include Indicators to show extent to which Valve is open.

Also makers of PILLAR-VALVES, SELF-ACTING BYE-PASS VALVES, OUTSIDE RACK AND PINION VALVES, HYDRAULIC-MAIN VALVES, DISC-VALVES, &c.

Every description of Pumping Apparatus, Hydraulic Lifts, &c., suitable for use in Gas-Works, made to order.

PRICES, SIZES, AND FULL PARTICULARS, WITH COMPLETE ILLUSTRATED CATALOGUE, FURNISHED ON APPLICATION.

Selig, Sonnenthal & Co.,



STEEL CASTING BRUSHES

FOR HAND.

Circular Casting Brushes for Lathes and Brooms,

Admirably adapted for Cleaning Hot Castings, &c., and for general use in foundries, gas-works, chemical works, &c.

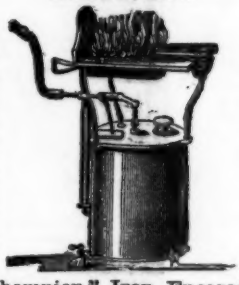
As Supplied to the Government and the leading English and Foreign Engineers, Gas-Works, &c.

No. 1, Brush,	3in.	wire,	2	rows,	16s.	dozen.
,, 2,	,,	3	,,	round,	22s. 6d.	,,
,, 3,	,,	3	,,	4 rows,	22s. 6d.	,,
,, 4,	,,	2	,,	4 ,,	24s.	,,
,, 5,	,,	3	,,	4 ,,	22s. 6d.	,,
,, 6, Broom,	12in.	block,	7in.	wire,	4 rows,	72s. per dozen.
,, 7,	,,	16	,,	7	,,	4 ,,	96s.	,,
,, 8,	,,	upright,		7	,,	4 ,,	48s.	,,
,, 9,	,,	12in.	block,	7	,,	10 ,,	180s.	,,
,, 10,	,,	16	,,	7	,,	10 ,,	228s.	,,
,, 11,	,,	12	,,	4	,,	4 ,,	84s.	,,
,, 12,	,,	16	,,	4	,,	4 ,,	72s.	,,
,, 15,	,,	12	,,	4	,,	10 ,,	128s.	,,
,, 14,	,,	16	,,	4	,,	10 ,,	180s.	,,

										each
Wheel,	6in.	dia.,	2½	wide,	1½	wire	projects,	5	rows,	½ hole, 10d.
,,	8	,,	2½	,,	1½	,,		6	,,	,, 13d.
,,	10	,,	3	,,	2½	,,		6	,,	,, 21s.
,,	12	,,	3½	,,	3½	,,		7	,,	1 28s. 6d.
,,	14	,,	3½	,,	3½	,,		7	,,	1 36s.
,,	18	,,	4	,,	3½	,,		8	,,	1½ 63s. 6d.

The "Champion" Iron Encased Forges.

Are specially suited for General Out-door Purposes, and will be found suitable to any climate.



PRICES

No.	SINGLE BLAST.	£ s. d.
1,	8 in. bellows, to heat ¾ in. sq. in 2 min.	6 0 0
2,	10 in. bellows, to heat 1¼ in. sq. in 2 min.	8 0 0
3,	12 in. bellows, to heat 2 in. sq. in 2 min.	10 0 0

No.	DOUBLE BLAST.	£ s. d.
4,	8 in. bellows, to heat 1 1-4th in. sq. in 2 min.	10 0 0
5,	10 in. bellows, to heat 2 in. sq. in 2 min.	12 0 0
6,	12 in. bellows, to heat 3 in. sq. in 2 min.	15 0 0
7,	14 in. bellows, to heat 3½ in. sq. in 2 min.	18 0 0

The "Champion" Iron Encased Forge,

With Vice-Drilling Frame on stand complete.

No. 10, Double Blast, 10 in. bellows, to heat 2 in. sq. in 2 min., £15.

No. 11, Double Blast, 12 in. bellows, to heat 3 in. sq. in 2 min., £18.

No. 12, Double Blast, 14 in. bellows, to heat 3½ in. sq in 2 min., £22 0s.

Sole Agents for the Lightning Screwing and Drilling Machines, Helical Pulley Blocks, Automatic Revolving Scrapers, Earth Borers, Tanite Co.'s Emery Wheels and Emery Grinders, Lathes, Genuine Morse Twist Drills, Cushman's Drill and Lathe Chucks, Patent Belt Screws, Patent Safety Belt Shippers, Casting Brushes, Shaped Diamonds, and a great variety of other Machinery always kept in stock or in progress.

LAMBETH HILL,

Queen Victoria St., London, E.C.

C. & W. WALKER,
8, FINSBURY CIRCUS,
LONDON, E.C.

MANN & WALKERS' PATENT SCRUBBER.

By Letters Patent in Great Britain, Europe, and the United States of America.

By some important improvements recently patented, the purifying power of these Scrubbers has been much increased, and a stronger ammoniacal solution obtained, which is found to absorb a large portion of the carbonic acid contained in gas, effecting an important saving in money and labour in the lime purifiers, and where oxide only is used the increase in the illuminating power of the gas obtained by these Scrubbers is shown in a remarkable degree, in consequence of the large quantity of carbonic acid removed from the gas.

It is to be particularly noted that the important results of these Scrubbers do not depend upon the machinery alone. The entire internal construction of the Scrubber bears an almost equally important part. For this reason, where it is desirable to convert existing Scrubbers whose dimensions happen to be suitable, the work commences by ripping out the whole of the interior of the shell, and beginning the internal construction *de novo* from bottom to top.

Fifty million cubic feet of gas per 24 hours are purified from ammonia by these Patent Scrubbers in a winter's day in the gas-works of London, where the purity of gas supply is the highest in the world, under the chemical restrictions of the Board of Trade.

Generally, wherever a high standard of purification is maintained in the chief cities and towns of the British Provinces and of Europe, these Scrubbers have become established.

By their use the department of purification from ammonia upon a gas-works is made complete, without the aid of prepared oxide of iron, chemicals in purifiers, or any other supplementary process, and the whole ammoniacal residual product contained in the coal is absorbed and obtained in the form most profitable to a gas company, while the requirements of all Acts of Parliament and of the Board of Trade relating to incorporate gas companies, are satisfied.

Foul Gas, properly condensed, entering the inlet is, by once only passing through the Scrubber, completely purified from ammonia with regular certainty day by day, without any further trouble, or any other process, effected by a very small quantity of clear water let into the machine-room at the top of the Scrubber, which is discharged at the liquor outlet at the bottom, from Newcastle coal at about 18 to 20 ounces strength, from Yorkshire and other coals generally from 25 to 30 ounces strength; while acidulated litmus or turmeric exposed at the Scrubber outlet will not show the slightest discoloration, and there is not a quarter of a grain of ammonia per 100 feet left unabsorbed.

They contain their own engine power, requiring only a small inappreciable quantity of steam from the gas-works boiler, and are then complete in themselves, ready for service.

Applications relating to dimensions and prices should be addressed to us, C. AND W. WALKER, 8, FINSBURY CIRCUS, LONDON, E.C., or to Mr. WILLIAM MANN, late Superintendent of the Chartered Gas-Works, BLACKFRIARS, LONDON; they should state approximately the largest make of gas in 24 hours on a winter's day, and the smallest make on a summer's day, to be purified.

R. DEMPSTER AND SON'S
WOOD SIEVES FOR PURIFIERS,

WITH TAPER OR PARALLEL BARS,

MADE BY SPECIAL MACHINERY.

SCRUBBERS FILLED WITH BOARDS,

On our approved principle, for the extraction of Ammonia.

Prices on application. References to First-Class Engineers.

ROSE MOUNT IRON-WORKS,

ELLAND, Near HALIFAX.

London Offices: 2, SUFFOLK LANE, CANNON STREET, E.C.

GAS *v.* ELECTRIC LIGHT.

WIGHAM'S PATENT GAS-BURNERS

FOR

STREET LIGHTING, &c., WHICH REQUIRE NO GLASS CHIMNEY.

Speaking of these burners, erected on the Thames Embankment, the Governor of The Gaslight and Coke Company, at the half-yearly meeting, Aug. 15, 1879, says:

"Any gentleman who may wish to see the light, may do so at the foot of Westminster Bridge, where it is in direct contiguity with the electric light, so that he will be able to judge for himself. There is a light there that completely excels the electric light in the intensity of its illumination, and in the scope of its diffusion. The lamps on Westminster Bridge are some of Mr. Wigham's."

SOLE MANUFACTURERS:

J. EDMUNDSON & CO., GAS ENGINEERS,

9, GREAT GEORGE STREET, WESTMINSTER, LONDON, S.W.

J. & J. BRADDOCK,
GLOBE METER-WORKS, OLDHAM,

MANUFACTURERS OF

WET AND DRY CONSUMERS GAS-METERS,

OF THE HIGHEST EXCELLENCE ONLY;

ROUND STATION-METERS,

ON CAST-IRON STANDS;

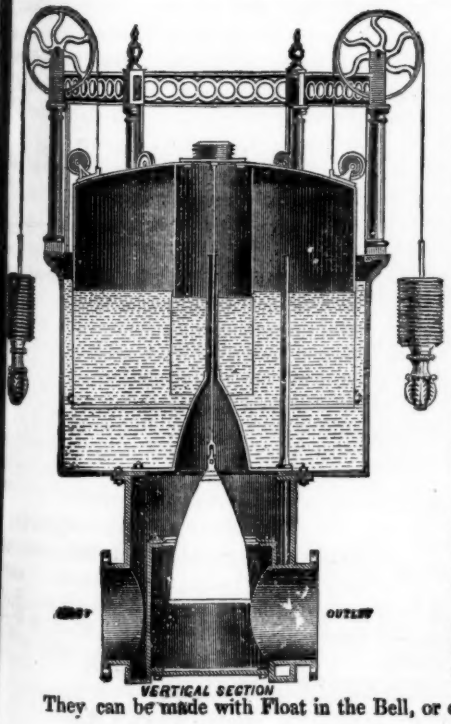
SQUARE STATION-METERS,

WITH PLANED JOINTS.

Messrs. Braddock beg to submit to Gas Engineers their

PATENT COMPENSATING GAS GOVERNOR,

Which is designed to give an uniform pressure at the Outlet to the Main at all draughts up to the full quantities which the Governors are made to control, such outlet pressure being less than the initial pressure.



VERTICAL SECTION

The uniformity of pressure is obtained by introducing a compensating chamber into the Bell or Holder of the Governor, which compensator is of the same area as the valve, both of which are operated on by the initial pressure, thereby placing the valve in equilibrium, no matter what the initial pressure may be. The action on the Bell is by the Gas passing along a pipe from the outlet, and the pressure is regulated by weights in connexion with the Bell as required.

From the sectional elevation attached hereto, it will be seen that only the Gas required to operate the Bell comes in contact with the water of the tank, which water will remain comparatively sweet and free from odour. That in case of accident to the Bell, no more Gas can escape than would pass up the pipe covering the valve-rod and Bell supply-pipe.

These Governors have been made and sent out of various sizes for from 2 to 30-inch Mains, and give most satisfactory results.

They can be made with Float in the Bell, or counterpoise as per section.

T. NEWBIGGING,

CONSULTING GAS ENGINEER,

5, NORFOLK STREET, MANCHESTER.

HENRY LYON,

MECHANICAL AND CONSULTING GAS ENGINEER,

NORWOOD, NORTHENDEN ROAD,

SALE, NEAR MANCHESTER.

SANDELL AND SON,

PUBLIC ACCOUNTANTS,

2, GREAT GEORGE STREET, WESTMINSTER.

Sandell and Son having been engaged during the last 25 years in Gas Companies Accounts, either in Preparing or Investigating Statements for Parliamentary Applications, Arbitrations, and otherwise, offer with confidence their Services for similar purposes.

Mr. ROBERT DEMPSTER,

CONSULTING GAS ENGINEER,

ELLAND, near HALIFAX,

May be consulted on all matters connected with Valuations, Arbitrations, and Parliamentary Applications connected with Gas-Works. Having been engaged on extensive Arbitration Cases, which, combined with his experience in Construction and Contracting, his knowledge of Engineering and Valuations is both extensive and reliable.

W. LIDDALL,

Public Accountant,

MOORGATE STREET CHAMBERS,

GREAT SWAN ALLEY,

MOORGATE STREET, E.C.

ALFRED LASS, F.I.Accts.,

SPECIAL ACCOUNTANT FOR GAS AND WATER UNDERTAKINGS,

30, GRACECHURCH STREET, LONDON.

Accounts Analyzed and Statistics Prepared for Parliamentary Proceedings, Arbitrations, &c.

The Forms of Account, which have been specially designed by Mr. Lass to meet the requirements of the Gas-Works Clauses Amendment Act, 1871, are now in use by many Gas Companies, Corporations, and Local Boards.

HARPER & MOORES,

PROPRIETORS OF THE

BEST STOURBRIDGE CLAYS,

STOURBRIDGE.

Manufacturers of all Descriptions of

BEST STOURBRIDGE FIRE-BRICKS, LUMPS, AND CLAY RETORTS

Of all Dimensions for Gas-Works,

GLASS-HOUSE POTS & CRUCIBLES

Established 1836.

The Highest Award was obtained by H. & M., at the Philadelphia Exhibition, 1876, for Superior Quality of Manufacture. Silver Medal, Paris, 1878.

TO MAKERS OF SULPHATE OF AMMONIA AND BUYERS OR SELLERS OF GAS LIQUOR.

F. SUTTON & CO., Norwich, are now prepared to Supply a Set of Apparatus with Standard Test Solutions for the rapid and accurate analysis of Gas Liquor, which can be used by any intelligent workman, so as to show the actual amount of Sulphate which can be got out of any sample of liquor in a few minutes, without any of the annoyance arising from saturation with acid, &c. Tables are also given, showing the quantity of acid of various strengths required for any given liquor, the accurate ounce-strength and percentage of pure ammonia, &c. Price of the set, with full direction and table (copyright), with materials sufficient for fifty analyses, £4 4s.

Post orders or cheques to be made payable to F. Sutton and Co., Manufacturing Chemists, Norwich, who also supply every description of Standard Solutions for Volumetric Analysis of Waters, Beers, Manures, &c., of guaranteed accuracy.

GAS AND WATER PIPES.

WILLIAM MacLEOD & Co.,

30, ST. ENOCH SQUARE, GLASGOW.

CAST-IRON GAS AND WATER PIPES.

DELIVERY F.O.B., GLASGOW.

Prices on application.

ROBERT MARSHALL,

CANNEL COAL MERCHANT,

198, ST. VINCENT STREET, GLASGOW.

SHOTT'S BOGHEAD.

HARTHILL CANNEL

Yields 14,920 cubic feet of 40·92-candle gas per ton.

THRASHBUSH CANNEL

12,530 cubic feet of 40·22-candle gas per ton, and 9 cwts. of good coke.

LOTHIAN'S CANNEL

Yields 12,500 cubic feet of 34-candle gas per ton, and 9 cwts. of excellent coke, containing only 4 per cent. of ash.

MUIRKIRK, No. 1, CANNEL

Yields 13,160 cubic feet of 32·5-candle gas per ton, and 10 cwts. of excellent coke, containing only 5 per cent. of ash. This cannel is almost free from sulphur.

OLD WEMYSS CANNEL

Yields 13,320 cubic feet of 32·5-candle gas per ton.

Prices and full analyses on application at above address, or from WEDDERSPOON, FERGUSSON AND CO., 21, Lime Street, LONDON, E.C.

HEBBURN MAIN GAS COAL.

This Coal is now highly approved of for gas making, and yields over 10,000 feet per ton of 15-candle gas, and about 14 cwt. coke.

For references and prices, either f. o. b. or by rail, apply to

W. RICHARDSON,

29, QUAYSIDE, NEWCASTLE-ON-TYNE.

GAS COAL.

POPE & PEARSON, LIMITED, have now the authority of several of the most eminent Gas Engineers of London in stating that their Coal yields *in practical working over* 10,000 *cubic feet of gas, with an illuminating power of* 16 *candles;* or by the standard burners now used by the London Gas Companies, an illuminating power equal to 17½ candles.

One ton yields 12½ cwt. of good coke. This Coal can be shipped from Hull, Goole, Liverpool, Morecambe, and Barrow.

For further particulars, apply to POPE AND PEARSON, LIMITED, West Riding and Silkstone Collieries, near LEEDS.

THE

SILICA FIRE-BRICK CO.,

OUGHTIBRIDGE

Near SHEFFIELD,

Manufacturers of THE ORIGINAL SILICA OR DINAS FIRE-BRICKS. Specially adapted for Gas-Retort Furnaces and for Siemens's Gas-Furnaces. Shipments promptly executed to London, Liverpool, Hull, Grimsby, &c.

BIRTLEY IRON WORKS,

CHESTER-LE-STREET, DURHAM.

Manufactory for every description of Casting and Machinery for Gas-Works and Water-Works.

Warehouse in London for Cast-Iron Pipes and Connexions of all sizes and in any quantity, Scott's Wharf, Bankside, Southwark.

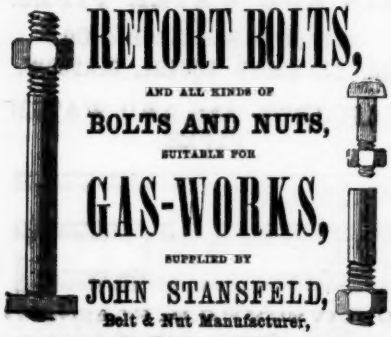
Agent in London, Mr. J. MANWARING, 161 Cannon Street, E.C.

M. BRÉMOND'S NAPHTHALINE PROCESS.

All negotiations respecting M. Brémond's patented process for preventing Deposits of

NAPHTHALINE

in Gas Main and Service Pipes should be addressed to Mr. W. H. BENNETT, 22, Great George Street, WESTMINSTER, S.W., or to M. BRÉMOND, Gas Engineer, Compania Madrilena de Alumbrado y Calefaccion por Gas, MADRID, who may be consulted upon all matters connected with the Gas Industry.



RETORT BOLTS,

AND ALL KINDS OF

BOLTS AND NUTS,

SUITABLE FOR

GAS-WORKS,

SUPPLIED BY

JOHN STANSFELD,

Bolt & Nut Manufacturer,

ALFRED ST., BOAR LANE, LEEDS.

FERRAND DAVIES,

148, GRESHAM HOUSE, OLD BROAD STREET, LONDON, E.C.,

AGENT FOR

THOMAS BARR'S LESMAHAGOW MAIN CANNEL

AND

NEWTON, CHAMBERS, & CO.'S SILKSTONE GAS COALS,

Analyses and Quotations on application.

WILSON CARTER AND PEARSON,

GAS COAL AND CANNEL FACTORS,

Supply to any Railway Station or for Export all kinds of Fuel for Gas purposes.

Address—CHIEF OFFICES:

TEMPLE BUILDINGS, 50, NEW STREET, BIRMINGHAM.

GEORGE ANDERSON,

GAS AND CONSULTING ENGINEER,

35A, GREAT GEORGE STREET,

WESTMINSTER, S.W.,

PATENTEE and MANUFACTURER of the following Inventions:—

RETORT SETTINGS—giving great Economy of Fuel.

STEAM-ENGINES and EXHAUSTERS, FOUR-WAY VALVES, WASHERS, SCRUBBERS.

FUEL-MACHINE, for Compressing Breeze and Tar.

N.B.—Pamphlet, with Eighteen Illustrations and Letterpress on the Construction of Gas-Works, post free, 2s. 6d.

PRICES AND ALL PARTICULARS TO BE HAD OF THE PATENTEE,

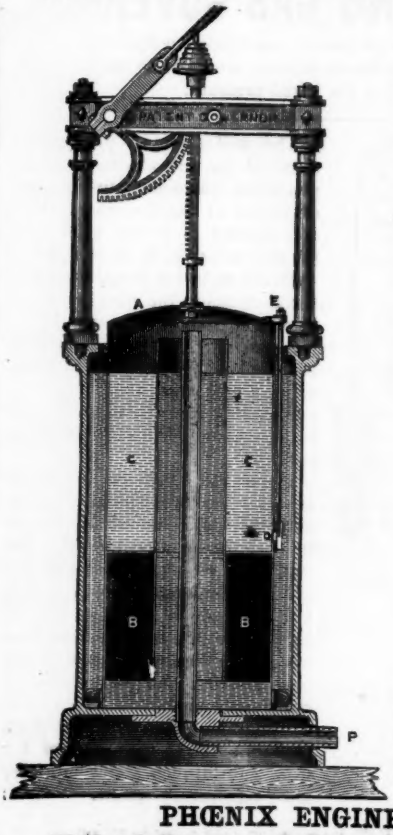
35a, GREAT GEORGE STREET, WESTMINSTER, S.W.

GEORGE WALLER & CO.,

GAS AND HYDRAULIC ENGINEERS,

Patent Compensating Steam Governor,

WITH SELF-CONTAINED WATER-BALANCE.



This is the most efficient and perfect Governor yet made to control and regulate the speed of Engines and Exhausters according to the varying make of gas, and maintain a steady gauge, whether working level or with six inches of seal.

It is the only Governor that will effectually control Condensing and Compound Engines, especially when the Exhauster is on light work, and the Engine is large.

During the drawing and charging of Retorts, the Engine requires no attention—a matter of great importance in small works.

Descriptive Circular sent on application.

They are in use at

BECKTON,
HAMPTON WICK,
DUKINFIELD,
HARTLEPOOL,
RAMSGATE,
SUTTON,

and about 30 other works.

G. W. and Co. make **special Steam Throttle Valves,** suitable for working with this Governor, and alter existing Throttle Valves to same plan.

See also advertisement, page 675.

PHŒNIX ENGINEERING WORKS,

Holland Street and Bear Gardens, Southwark, S.E.

PARIS EXHIBITION, 1878.

THREE MEDALS
AND
HONOURABLE MENTION
HAVE BEEN AWARDED TO
JOSEPH CLIFF & SONS
For their Various Exhibits, amongst which is a
SILVER MEDAL
FOR THEIR
PATENT MACHINE-MADE
RETORTS AND FIRE-BRICKS,
Being the Highest Honour given for this class.

Established

1795.

JOSEPH CLIFF & SONS,
THE ORIGINAL
WORTLEY FIRE-BRICK WORKS,
NEAR **LEEDS,**
London Wharf: No. 4. inside Great Northern Goods Station, King's Cross, N. Liverpool: Leeds Street.

SPECIAL NOTICE.—Our Patent Machine-Made Retorts have now been thoroughly tested, and have proved themselves infinitely superior to those made by hand. At several large works it has been settled, beyond question, that, owing to the compactness and general excellence, more gas is sent to the gasholder from each ton of coal carbonized than is the case with hand-made Retorts.

SAMUEL CUTLER & SONS,
CONTRACTORS FOR GAS & WATER WORKS, GENERAL ENGINEERS, IRONFOUNDERS & MANUFACTURERS OF
GASHOLDERS, TANKS, PURIFIERS,
SCRUBBERS, VALVES, EXHAUSTERS, IRON ROOFS, BRIDGES, BOILERS, AND GENERAL CAST AND WROUGHT IRON WORKS.

S. C. & SONS undertake the entire erection of New, or Remodelling of existing Gas-Works in any part of the World, including small Works for MANSIONS, FACTORIES, &c., or Works of the largest extent (are now constructing the largest Gasholder yet erected); also the supplying and laying of MAINS.
They make a speciality of supplying every requisite whatever for Gas-Works, keeping in Stock what are most in request. WOOD SIEVES for Purifiers and Scrubbers, of a superior make.
SPECIAL CASTINGS to Drawing or Pattern at Shortest Notice.

Manufacturers of MORRIS & CUTLER'S PATENT CONDENSER & CUTLER'S PATENT GAS-WASHER.

DESCRIPTION OF MORRIS & CUTLER'S PATENT CONDENSER.—The Condenser may consist of pipes arranged in tiers, or in any other form most convenient to the site available, each tier being connected with special connections, and containing within same either one or more coils of smaller pipe through which water is passed, being supplied from any convenient source of supply, the water passing in an opposite direction to the gas, so that the coldest water is at the gas outlet. The power of the Condenser can be regulated precisely in proportion to the quantity of water allowed to pass through, which is not in any way contaminated, but simply heated by the hot gas, and advantage can be taken of its being at a high level to carry it to a high-level cistern, from whence it can be used for supply to boiler or any other purpose. The Condenser itself may form the support for a high-level cistern. By an arrangement of valves the water may be shut off, and an air orifice opened, when air will pass through instead of water, or both air and water can be shut off. The power of the Condenser is, therefore, entirely under control. The Condenser may be seen in operation at the Brentford Gas-Works.

For further Particulars, apply to Mr. F. MORRIS, GAS-WORKS, BRENTFORD, or to S. CUTLER & SONS, PROVIDENCE WORKS, MILLWALL (Near the Steamboat Pier), LONDON, E.

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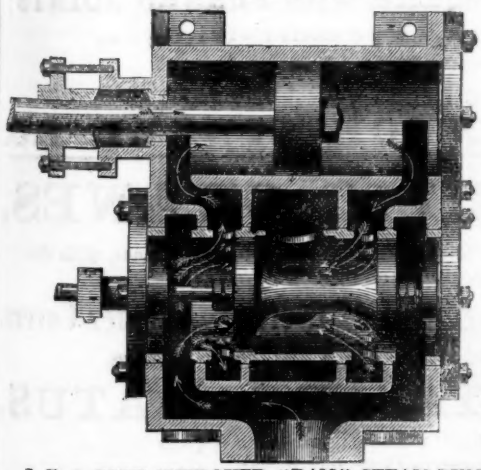

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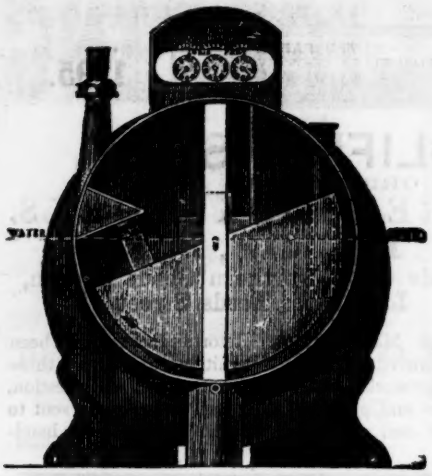

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